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ARCHITECTURE

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DECORATION

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CONSTRUCTION

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Cheap Houses at Passaic, N. J., Litchfield, Conn., and Larchmont, N. Y.

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A CURIOUS discussion arose at the inquest upon the disaster at the Midland Hotel in Kansas City, by which the trusses over the large dining-room fell, killing a man who happened to be under them. The architect, Mr. Burnham, of Chicago, immediately hastened to the spot, and easily found the cause of the accident. It seems that the roof trusses, which weighed thirty-five tons each, were arranged to have their feet rest on iron plates, set on the brick wall. With their usual care, Messrs. Burnham & Root estimated the safe resistance of the wall, which they set at seven tons to the square foot, and, in accordance with this estimate, made the plates on which the feet of the trusses were to rest each three and seven-tenths feet in one direction, — the length, we may suppose, — specifying at the same time that the thickness should be two and one-quarter inches. After the accident they discovered that their drawings and specifications had been boldly disobeyed; that the plates were only one and one-half inches thick, and twenty-one inches, instead of forty-four inches long. Naturally, the weight, concentrated on an area not half large enough to carry it, crushed the brickwork, allowing the truss to fall. Mr. Burnham explained this very clearly to the coroner's jury, and was corroborated by the man who set the iron plates, who coolly said that the foundry-men often "made changes" in plans for buildings. It ought to be obvious enough that the whole responsibility of the accident should rest on the shoulders of the parties who deliberately and wilfully violated their contract to vary from a plan delivered to them, but it seems from the account that "the popular opinion" is that "the iron-men ought not to bear all the blame," and that the architect "should have inspected the construction at each stage." The origin of this theory, is, no doubt, to be found in the suggestions made by the iron-men to their friends, but we should hope that it might not be taken seriously. In a matter like this an architect with any considerable practice cannot possibly keep in his mind the details of all his buildings. Probably the plates, as they lay on the walls, looked large enough for supporting girders, or something of the sort; and it would be a superhuman architect who could always remember, when he saw a plate laid on a wall, what weight was to go on top of it. We remember a story told of Sir Gilbert Scott, whose practice was probably smaller than that of Messrs. Burnham & Root. Sir Gilbert had been commissioned to build two churches, about the same time. He "supervised" them with the care which is apparently usual among architects of distinction in England, until completion and consecration arrived. On his way, with his principal assistant, to participate in the latter ceremony at one of them, he was observed, on arriving in sight of the building, to turn pale for a moment. He held his tongue, however, like a politic person as he was, and seemed to enter heartly into the joy of all of the people about him. When the ceremony was over, and he was on his way home, he whispered to his assistant, "That was the wrong church!" Explanations followed, and it appeared that the draughtsman in the office had got the sketches of the two churches mixed, and had built at Y a church designed for X, and at X the one intended for Y. The church authorities were, however, none the wiser, and never complained; but the example shows the vigilance of supervision which was thought suitable for the head of the profession in England. To say that such a man as that ought to be wholly or partly responsible for an accident caused by the deliberate violation of his orders on the part of the contractor seems absurd; and if Messrs. Burnham & Root made their computations correctly and drew the plan for their iron work in accordance with them, we cannot see why they should be expected to learn their computations by heart and carry them about in their heads, or why they should be held in the slightest degree accountable for the effects of the contractors' deliberate and not easily detected disobedience.

OF late years, according to *La Semaine des Constructeurs*, a great number of incendiary fires have occurred in Russia. Twenty years ago only one and one-half per cent of the fires occurring in that country were set purposely. Now the proportion has changed, and, taking the country and cities together, about eleven per cent of all fires are incendiary, while in the rural districts seven fires out of eight are intentionally set. So serious has the matter become that several years ago the insurance companies refused to issue any policies upon houses in the country, and the village authorities were obliged to form mutual-assessment organizations among the population, as a substitute for insurance. Even this did not answer the purpose, incendiarism continuing almost unchecked; and the mutual-protection system has been entirely dropped in some places, while in others the premium rates have been made so high that the peasants will not pay them. In one province, however, a new experiment has been tried, which appears to work well. In the villages of this province the limit of risk upon any one building is set at forty-seven dollars, a sum which would not pay for a log hut; and the peasants, finding that they cannot get money enough to build a nice new house by the simple process of setting a torch to their old one, have not only stopped the practice of incendiarism on their own account, but have established night patrols to see that no amateur practices upon property which does not belong to him. The same device for preventing incendiarism, by refusing to insure any property to more than one-half or two-thirds of its value, is often discussed by insurance companies here, but the competition among the companies is so sharp that it has never been adopted; and any person can practically insure his house for any sum he pleases, the underwriters protecting themselves only by the privilege reserved in the policy of rebuilding the burned structure, in case of loss, instead of paying for it.

A HUGE engineering operation is under consideration in Holland. This enterprise aims at nothing less than the reclamation of the Zuyder Zee. This great estuary which extends from the northern end of Holland nearly to the Belgian frontier, covering an area of six hundred and eighty-seven square miles, and lined with flourishing seaports, is said to have been formed by a sudden irruption of the ocean in the year 1282, which broke away the protecting barrier of sand, dividing it into a range of islands much like our own Sea Islands, and covering a considerable part of Holland with water deep enough to float large vessels. In fact, as the North Coast of Holland is almost destitute of harbors, the Zuyder Zee became the refuge for multitudes of fishing and trading crafts, and the seaports upon its border, Amsterdam, Hoorn, Enkhuizen, Harlingen, Hindeloopen and Stavoren, grew so prosperous that the inhabitants of Stavoren, for want of anything else to do with their money, are said to have made the bolts and latches of their doors, the fittings of their boats, and even the weather-cocks on their churches, of pure gold. Even now, an immense fishing and coasting traffic goes on over its waters, and the most elegantly finished and thoroughly appointed little steamer we ever saw, fitted throughout with incandescent electric-lights, and as comfortable and clean as a steamboat could be, once took us across it from Enkhuizen to Stavoren, but the channel connecting it with the North Sea is fast silting up, and the former glory of the towns on its shore is now to be inferred

from the beauty and richness of the old houses along their streets, and the splendor of the ancient pieces of furniture displayed in the bric-à-brac shops, among which we have seen a small sideboard, or rather, a sort of dining-room cupboard, with the front of solid silver. It is well-known that the beds, of lakes afford very rich land, and the Dutch engineers naturally have visions of the bottom of the Zuyder Zee covered with grass, and yielding food for great herds of black cattle, but the enormous expense of draining it has hitherto deterred any one from talking very seriously about the undertaking. Now, however, a powerful association has been formed in Holland, devoted to the object of raising money, and securing Government aid, for carrying it out, and it seems that it is likely to succeed. To construct the necessary works, and pump out the water from a navigable inland sea forty miles wide and seventy-five miles long, and fed by a dozen rivers, will take years of time, and twenty or thirty million dollars in money, but it is calculated that the sale of the reclaimed land, if carried on prudently, so as not to overstock the market in any one year, will repay the outlay at least twice over.

MANY architects will regret to learn of the death, at the early age of forty-two, of Mr. J. W. Kitson, of New York, one of the best architectural sculptors who ever came to America. Mr. Kitson was born in England, and served an apprenticeship with Messrs. Farmer and Brindley, the noted London stone-carvers. On completing his term with them, he resolved to try his fortune in America, and sailed for Philadelphia. Soon after reaching Philadelphia, however, he found that one of his old friends and shopmates, Mr. Robert Ellin, was in business in New York, and, joining him, the firm of Robert Ellin & Company was established. This became later the renowned firm of Ellin & Kitson, which has for twenty years executed a very large part of the best stone-carving in and around New York, and counts among its achievements many works which would do honor to any city in the world. For its success, the firm, particularly in its early days, was greatly indebted to the business-like methods, and earnest desire to please, of both its members. All architects who have practised in New York will remember the frank, pleasant ways of Mr. Kitson as well, perhaps, as his remarkable cleverness in designing and carving, and the profession will have good reason to deplore his loss.

LE GENIE CIVIL quotes from a military journal a rather valuable suggestion for deafening floors. This suggestion, which is due to General Loyre, proposes, instead of loading the floors with a sheet of plastering, to fill in the space between the floor-boarding and the plastering of the room below with shavings, which are first to be rendered incombustible by dipping them in a tub of rather thick whitewash. It is well-known that soft substances enclosing air-spaces, form the most efficient deafening, and shavings treated in this way are so incombustible as to add considerably to the fire-resisting quality of the building in which they are used. In cases where it is desirable to disinfect the space between floor and ceiling, the shavings may be saturated with chloride of zinc, or zinc chloride may be added to the lime wash.

FIRE AND WATER makes some sensible comments on the recent burning of the Union Square Theatre in New York, which most persons, familiar with the circumstances, regard as a fortunate event for the persons who have so often risked their lives by passing an evening in it. The theatre has long been known, in the words of *Fire and Water*, as "a rickety old death-trap," and it could not have been destroyed at a more favorable time, no one being in the building. The fire caught first in the hotel adjoining, and communicated readily with the stage of the theatre through one of the "fireproof doors" which closed the openings, through the wall. As soon as the flames reached the scenery on the stage side of the wall, the theatre blazed up like a stack of hay, and was soon in ruins; and if an audience had been collected in it, few would have escaped. According to a table accompanying the article, fourteen theatres have been burned in New York within the last twenty-two years. Most fortunately, the loss of life from these conflagrations has not been serious, but the fact remains that no city in Europe or America has had so many theatre fires in twenty years past as New York, and it is merely a piece of good fortune that half of them, at least, were not as fatal as the conflagration which destroyed the Brooklyn or Richmond theatres.

ANOTHER of the Paris bridges, the third within ten years, has given signs of collapse, and has been closed to travel while the work of repair is going on. The one now in trouble is the Pont d' Arcole, the well-known iron structure which connects the Hôtel de Ville with the region about the Cathedral of Nôtre Dame. The bridge, which is only about thirty years old, is composed of twelve arched ribs in the form of a low circular segment, about two hundred and sixty feet in span, and built up of plates and angle-irons. To regain the level of the roadway, long horizontal girders of iron are laid over the arched ribs, and the spandrels between the ribs and the girders filled with lattice-work. In order, apparently, to keep the horizontal girders from sliding out of place, they are anchored at each end to long rods, with cross-pieces at the extremity, buried in the ground. The probability seems to be that these rods were the first portions to give way. A few days ago the arched ribs were seen to have changed their shape, rising at one side, while the other sank, and the bridge was immediately closed. On examination it was found that all the rods on one side were broken off. Some of the breaks were old, but most of them showed recent surfaces, and as the people living in the neighborhood testified to having heard a succession of loud reports, it is quite likely that several may have given way together. Whether the breaking strain was caused by contraction, due to cold, or to the effect of the vibration of the bridge upon the rigid members connecting it with the mainland, no one can say positively, but both factors seem to have been of importance.

SHORTLY after the fire which destroyed in an hour or two the immense storage warehouse of the Berlin Express Company, a similar conflagration broke out in a large building in Birmingham, built in the same way, with iron beams supported by iron columns. This seems to have burned even more rapidly than the Berlin building, which, however, was greatly protected by its brick partition wall, and in a few minutes all the floors and roof had fallen into the cellar, and the walls were shattered beyond repair. A New York architect would have predicted just this result, but it seems to have been a surprise to the people of Birmingham, and the *Daily Post* of that city calls upon the authorities to forbid for the future the construction of such buildings, much as the New York newspapers railed at our iron construction after the first fires which demonstrated its weaknesses. The fact is, as *La Semaine des Constructeurs* points out, that no material known is so well suited for resisting most of the strains occurring in buildings as iron, provided the metal is properly protected from the influence of fire. The best methods of affording this protection are well understood here, but in Europe they have as yet been little practised, and *La Semaine* calls upon the French architects to "enter upon a new course," and adopt the system of protected construction "already in use in other countries."

THE *Revue Industrielle* gives some statistics of the amount of steam-power now in use in different parts of the world, from which it appears that the United States consumes more power from stationary engines than any other country, the total force of all the stationary engines now in use in this country being seven and one-half million horse-power, while all those in England only amount to seven million horse-power, those of Germany to four and one-half million, those of France to three million, and those of Austria to one and one-half million. Whether this estimate includes the engines of steamboats we are not informed, but if it does, we may well be surprised at the development of manufactures which should have placed our own country in advance of the combined manufacturing and commercial energy, as expressed in units of steam-power, of Great Britain. If we add the power of the one hundred and five thousand locomotives known to exist in the world to that of the stationary engines, and reduce the total by the ordinary rule of regarding one horse-power in a steam-engine as equivalent to the labor of twenty-one men, we shall find that the steam-power at present available in the world is equal to the force of about one thousand million men, or, to put it in another way, the accumulation of capital and development of science have placed at the service of the fifteen hundred million inhabitants of the earth the labor of a thousand million more of the most obedient, faithful and untiring slaves that the world has seen.

NOTES OF TRAVEL.

CHICAGO. — V.[1]

ABOUT the year 1830 a trading-post and United States fort was established on the banks of Lake Michigan, at a point where a small stream emptied itself into the lake. This post was named Fort Dearborn. A more unprepossessing site could hardly have been chosen in the whole of Illinois, and yet it was the beginning of the now mighty city of Chicago. The location for commercial purposes was excellent, being on the great highway of the lakes and in what has proved to be the great highway of travel from the east to the west. The country for miles around was at that time perfectly flat, rising hardly two feet above the lake, and being in many places, marshy and disagreeable in its aspect. The river, which for lack of a better name has been dubbed the Chicago river, was originally nothing but a creek, formed by the confluence of two small brooks, uniting about a half a mile from the lake shore and flowing thence towards the east. The river and its two branches formed a natural division of the territory since occupied by the city, into the North, South and West Sides. The South Side has always been the business portion of the city, and here all the heavier buildings have been erected, while the North and West Sides are mainly given over to residences except along the banks of the river. The South Side from about two miles below the river is also used for private purposes. The soil on the north side of the river is fairly suitable for building purposes. The South Side, however, where the best foundation was required to meet business wants, was, in the early history of Chicago, often flooded with water, both from the lake and from the river, and within the memory of many people now living in Chicago, the whole South Side has been under water. The city was built so close to the lake and river, and there was so little anticipation in the beginning of the subsequent growth which was to give Chicago its place among the great cities of the world, that the streets were raised hardly more than four feet above the lake-level. Of course, it was impossible to have any good system of sewers under such conditions, and in early days, the sewerage was something which the present inhabitants can hardly imagine. With the fire of 1871, however, came a great change both naturally and architecturally. The entire business portion of the city was swept away, only two buildings remaining in the whole district. The City Government, which had long understood the necessity for improving the natural conditions, immediately decided upon raising the grades of the streets, and the refuse material from the burnt buildings was used for this purpose, the levels being elevated, we believe, something like twelve feet, an undertaking which has hardly been equalled anywhere else in the world. It should be understood however, that this movement was partially begun at the time of the fire, but the fire left the way so clear that all the new buildings conformed to the new grade.

The conditions which now exist, are, in short, as follows: The soil upon which heavy buildings have to be erected is found to be a black loamy clay which at the surface is tolerably firm and will sustain a load of one to three tons per foot, depending upon the locality. A few feet below the level of the ground, however, the soil is quite soft, being, less stable the farther down excavations are carried, until, at a depth of from twelve to eighteen feet it is so yielding that nothing can be placed upon it with any reliance. Nor is this all. It has been discovered by many sad failures in buildings that there is a broad, subterranean layer of soft mud which lies directly across the most heavily built portion of the city, extending under the Post-Office and reaching from the lake to the river, a distance of three-quarters of a mile. The natural clay is bad enough but this soft mud is a constant source of trouble to Chicago builders.

It is with these conditions, upon such soil as this that the buildings we have described in previous articles have been erected, conditions probably not equalled for perverseness anywhere else in the world.

In order to attain the degree of thoroughness with which the present foundations are planned and executed, there has been a gradual development on the part of the architects and builders, a development not always keeping pace with the importance and size of the buildings, by any means, but the progress being none the less sure and the results none the less satisfactory. In the early buildings the foundations were built continuously under the whole structure, the footings being spread ten to fifteen inches each side of the wall, generally without any regard to the soil or the loads thereupon.

The first step in improvement was to proportion the width of footings to the loads bearing upon them; but it was soon discovered that this was not sufficient. The wall will settle more than the pier and the corners of the wall will settle less than the centre, and it is not always expedient or possible to vary the footings under a single wall, while the superstructure remains the same thickness. On one or two occasions an attempt was made to solidify, as it were, the crust of the earth, by a heavy bed of concrete, which it was assumed would equalize the pressure and prevent any settlements. This plan was tried for the foundations of the Post-office and Custom-house, a large building erected under the supervision of the Government architect. A bed of concrete, some three feet in thickness, was spread over the entire area to be covered by the building, and upon this the walls and foundations were started exactly as if they were resting upon solid rock. The result has been most disastrous. There is not a wall in the entire building which has not been cracked through and through, nor is there a string-course or a cornice which can show anything like a horizontal line. The concrete-bed scheme proved a total failure, and has not been resorted to since. Mr. Frederick Bauman was, we believe, one of the first to thoroughly appreciate the problems involved in Chicago foundations and to devise a scheme for building upon such poor earth. The plan he adopted has since generally been followed in the construction of all the larger buildings. It is not a new principle, by any means: it is simply the old Gothic idea of building with isolated piers so that all the loads and weights are concentrated at points, and the foundations under these arranged so that the pressure on the earth shall be exactly equal in all portions. This is a scheme which requires the nicest of calculations, and, undoubtedly, it would seem almost impossible to so plan a building that the weights on the footings throughout shall not only be exactly alike in their action, but shall be so proportioned in regard to size that each pier shall settle at exactly the same rate without any crackings or detriment to the superstructure. This is, however, exactly what has happened in Chicago, and there are plenty of examples of buildings where the calculated result agrees exactly with the final condition of the building.

But, having arrived at the true system necessary for building upon such soil as underlies Chicago, there was still a difficulty before the Chicago architects. We have noted how the soil becomes very soft in proportion as one descends below the ground. It is, therefore, quite desirable that the foundations should be carried down no farther than is absolutely necessary. It is also important that each building should have a cellar under it both for convenience and for utility as regards business purposes. But, at the same time, it would not do to have the footing-courses project into the cellar. To obviate the difficulties involved in the use of deep foundations and to meet the requirements of the case, a scheme was devised which we think was first adopted by Messrs. Burnham & Root. This consisted in the use of iron or steel beams in the foundation.[2] Under each pier is laid a bed of concrete eighteen or twenty inches thick, the area being sufficient to distribute the load of the superstructure so that it will not average more than one and one-half to two and one-half tons per square foot. Upon this footing-course is laid a row of steel railroad irons placed six or eight inches apart, and extending nearly to the extremities of the concrete on all sides. Above this is laid a second tier of beams which cross at right angles and are the same length as the width of the layer below, but are not carried out on either side. Above this again, is a third row of beams laid at right angles with the second and again drawn in as before. If necessary a fourth row is placed above all, the area of the final layer being equal to the size necessary for the foundation pier. As the railroad irons are quite stiff and can be placed as close together as necessary, it will be appreciated that the foundations can be spread out with any desired rapidity without taking up a great deal of vertical space, thus permitting the bottoms of the foundations to be kept quite close to the cellar floor.

In one case of which we know the foundation was increased in width fifteen and a half feet in a vertical height of only nineteen inches. Of course, any such scheme of construction would be simply impossible with any other material than iron or steel. It should be said for this system that it is as yet untried by the test of wear. We believe there is no building with iron foundations that has been built over four years, consequently it cannot be determined with absolute certainty what will be the ultimate durability of this system. The iron beams are thoroughly imbedded in concrete which of itself would serve to thoroughly protect them from rust or decay, but, after all it is still an untried feature and some of the Chicago architects have not felt warranted in risking it, though as a rule it has been adopted by those who have planned the heaviest buildings.

In order more fully to illustrate the manner in which the foundations are planned and calculated let us suppose a given building and follow the steps which the designer would take in planning for the portion underneath the ground. At the very outset a departure is noticeable from eastern ways. The ordinary strength of floors in a building used for offices or business purposes is assumed to be one hundred and twenty-five to one hundred and fifty pounds per square foot, independent of the weight of material. This, of course, is none too much in considering the strength of the floors. At the same time, it would be apparent to any one that under no circumstances could any such aggregation of load come upon the foundations as would be represented by one hundred and fifty pounds for every square foot of flooring in the building. In times past Chicago architects figured on this basis and found that the walls and piers settled unevenly. The actual weight of one hundred and fifty pounds per

[1] Continued from No. 639, page 142.

[2] In the *Inland Architect* for March may be found a discussion and fuller illustration of this method. — EDS.

foot was purely theoretical and was never reached in fact, consequently in determining the loads which are to go upon the foundations the practice in Chicago now is to assume not over twenty-five pounds per square foot in addition to the weight of materials. We were told by one architect that in the Marshall Field storage-warehouse the load on the floors was assumed at fifty-five pounds per square foot in determining the foundations: but in ordinary office-building work it is estimated to be eighteen pounds per square foot. It will readily be perceived what an immense difference such a process of calculation will make in the size of the footings.

The ground under the foundations is assumed to be capable of sustaining a safe load of from one and a half to two and a quarter tons per square foot. Mr. Bauman, we believe, recommends one and a half, but in buildings begun since the first adoption of his system of isolated piers, much heavier loads have been placed upon the ground with perfectly satisfactory results. The loads on the piers of the Board of Trade Building vary from two and three-fourths to three and seven-tenths tons per square foot. The size of the footings under the piers and the corners is made less than that under the walls to offset the difference in settlement of the different portions of the building. It is found that a heavy pier will sink proportionally more than a light one, consequently the footings under the larger piers have, relatively, a greater area than those of the light ones. Again, it is necessary to take account of the material of which the superstructure is to be built. Thus a footing under a brick wall is made larger than a footing under a line of iron columns, so that, if both footings are loaded with the same weight per square foot, any inequalities due to the difference in settlement or compressibility between the brick wall with its many joints and the rigid line of iron columns will be entirely obviated. This may seem like splitting the constructional hair or sound like an impossibility, but it is what has to be done if the building is to stand properly in Chicago. And there is another arrangement which is sometimes carried out. The foundation is laid with the centre of gravity a little outside the centre of gravity of the wall above, the idea being that the building will settle inward and together rather than having any tendency to settle out or to dislocate or rack the floors.

To make sure that the loads and strains will act in the way they are calculated to act, it is necessary that the floors should be thoroughly tied and keyed. In the best work it is customary to join the beams so closely by means of tie-irons that the entire floor in each story is a solid frame, and any movement at one corner of the building is immediately felt at the other extremity, there being no allowance whatever for expansion or for loose joints. Furthermore, the walls are sometimes tied together in a manner which we believe has seldom been adopted in the East, though it is quite common in England. Continuous rows of hoop-iron three or four deep are built into the walls at regular intervals, extending entirely around the building, thoroughly tying the structure together and making it one compact mass.

In planning a Chicago building there are two grades which the more courageous of the Chicago architects put upon their drawings: one is the grade at which the first floor or street line will be started, and the other is the grade, a few inches above that of the street, to which the walls will ultimately settle. It must require a great deal of confidence in one's drawings and calculations to be willing to draw a line across the front of an elevation and say positively that the huge structure will settle to that exact extent, and yet that is what is repeatedly seen upon the drawings of some of the Chicago architects: Burnham & Root showed these two grades upon the drawings of their enormous Rookery Building, and the building has settled almost to a hair's breadth of the amount stated by the architects, and this, too, without any inequalities of settlement or the slightest difference of level between the two ends of the building. The same might be said of the Ope.a-house Building by Cobb & Frost. The long corridor of this building, which is not far from two hundred feet in length, gives an excellent opportunity to judge of any inequalities, and the writer was told that the greatest difference in level between the two extremities of the corridor after the building had ceased to settle was less than a quarter of an inch.

As regards the actual amount of settlement, this, of course, varies with the locality and the nature of the building as well as with the load which is placed upon the ground. In the early days builders did not dare to load their buildings very heavily, as their aim was to avoid any settlement whatever. It is simply impossible, with the Chicago soil, to avoid some settlement; it is bound to take place and the architect must so plan his building that the settlement shall be equal in all parts with a load of two and one-half tons per square foot. It is estimated that a building will settle about four inches altogether. The rate of settlement is pretty fast for the first year, and after that keeps on slowly for about three years, at which time all settlement ceases.

It must not be supposed that all Chicago buildings are built with the degree of care implied by the foregoing statements. In fact, most of the Chicago buildings are not well planned in their foundations and the settlements which take place are noticeably frequent. One building on Randolph Street to which the writer's attention was called settled in the central portions twenty-eight inches, while the side walls did not settle at all. Another building, which was erected in the fall when the ground was somewhat stiff with the cold, settled six inches during the next six months. Another instance is a building covering an entire block; one corner settled twelve inches, the adjoining corner settled six inches, and the diagonal corner did not settle at all. In this case the settlement was so marked that it shows very perceptibly on the front, not a single window-opening being square. There are so many unforeseen difficulties in the soil and in the superstructure that it is an exceedingly delicate task to properly proportion the foundations, and the only wonder is that there have been so many successes.

It might very naturally be asked why the Chicago architects have never resorted to piling. Aside from the expense and uncertainty attached to work of this kind, Chicago architects have apparently preferred to stick to the plan which they have laid out for themselves and to work it to final conclusions, rather than to resort to different methods of construction. There would be no real difficulty, however, in piling, as has been proved in many instances whereit was absolutely necessary. In the construction of the huge grain-elevators, which are scattered through the city, the loads are so excessive, reaching as high as six tons per foot, that it would be impracticable to support them upon ordinary footings, and piling has been resorted to. The piles are driven a distance of twenty to forty feet down to hard-pan, capped by wooden sleepers, with heavy wooden cross-beams and solid planking to receive the masonry. Even in piling, however, a system of isolated piers is adhered to, the loads being concentrated and the piles driven in clusters. Such is, in brief, the actual condition of the Chicago foundation work. It will be seen that the subject is a vast one, involving many possibilities of danger and uncertainty, but these have been bravely met by the Chicago architects, and though the successful attempts are almost the exception rather than the rule, they demonstrate the possibility of erecting the vast buildings on as treacherous a soil as exists anywhere in the world, with a surety in regard to final conditions and an almost absolute certainty of exact movements in superstructure.

C. H. Blackall.

OUR SENATORS AND THE CONGRESSIONAL LIBRARY.

After Raquenet.

Although there are some parts of the following discussion that seem to lack the perfect propriety of a dignified parliamentary discussion, it may be more useful than harmful to quote at length the remarks made in the Senate Chamber on March 7.

There is one remark by Senator Plumb that deserves all the weight of an aphorism, and might be kept standing in type at the head of a column in those journals which hope that, sooner or later, Government may adopt a wiser method of procuring designs for its public buildings than it follows at present. Senator Plumb states the situation well in saying: "When we consider the extravagance which the Government always indulges in in the building of public buildings, it is readily to be seen that a building which would cost the Government $100,000, *could not in any possible way be more than one-quarter the size of a building which private parties would build with* $150,000."

Mr. Daniel.—Mr. President, it is not my purpose to detain the Senate at any length on this question; but I think it my duty to reply to a few observations made by the Senator from Kansas [Mr. Plumb] on the 9th of February last.

On the 9th of February a bill was brought up here making an appropriation for the erection of a public building at Pensacola, Fla., whereupon the Senator from Kansas and other Senators took occasion to refer to bills which had been proposed for public buildings, and scattered their animadversions around so miscellaneously that it was difficult to understand upon whom their censure was directed.

The Senator from Massachusetts [Mr. Dawes] referred to the fact that in St. Louis a building had been commenced with an appropriation of $3,000,000, and, under the influence of public dinners at St. Louis given to the public architect, that appropriation was increased to $7,000,000. The Senator from Kansas [Mr. Plumb] followed up with some general observations on the subject, concluding with these remarks:

But something has been said about the reasons for these deficiencies. Mr. President, it is the old story of a dollar for the dress and $10 for the trimmings. Every public building which is put up costs ten times more for superintendence and extras and contingencies than it ought to do. Out of $100,000 appropriated to erect a building, say, out in Kansas, at least $10,000 of that money will be spent before ever a lick is struck. There is the city of Wichita, where the Government has simply a naked lot. There is no more danger of its being carried away than of this Capitol being carried away, and yet it has a watchman and a superintendent, but no man at work.

Mr. Hale.—They are watching the land.

Mr. Plumb.—Yes, they are watching the land. I do not know but that they are watching the Republican politicians out there. At all events, the watchmen are there, and they are getting paid for it. The Senator from West Virginia [Mr. Kenna] says to me that the Republican politicians there need watching. If they do you will have to appoint a great deal more clever people than you have done out there in order to make that watching very effective.

Mr. President, I have no doubt that there has been very gross extravagance in the matter of public buildings, and I am not disposed

to hold any one to responsibility for remarks which may inure to its correction; but I think it would be well if those gentlemen who are indulging in severe criticisms upon this floor and who are holding up a system of extravagance to public opprobrium would at the same time inform the public that their criticism partly belongs to an administration of which they were themselves supporters and that their criticisms cannot possibly be directed to those public officers who are now conducting this branch of the public service.

It is true that there is a public building in the city of Wichita, Kans., in process of erection, and if there be delays about it, or if watchmen have been retained there unnecessarily, and if that matter is to be made a subject of censorious comment upon this floor, it is fitting that those comments should give to the public the reasons for the action taken, and so that responsibility should be fixed upon the proper persons. I hold in my hand a letter of October 4, 1887, addressed to the Supervising Architect of the Treasury Department by the Senator from Kansas:

UNITED STATES SENATE, Emporia, Kans., October 4, 1887.

Dear Sir, — Permit me to call your attention to the public building which you are proposing to erect at Wichita. Since provision was made for this building Wichita has grown very greatly, and buildings five stories in height have been erected by private capital. I am informed that the plans as prepared in your office contemplate a building two stories in height merely. This will result in an inferior-looking building. I doubt also if the necessary room can be provided in a building of two stories, as you perhaps know there is a United States land-office at Wichita, and United States court is held there, and there will need to be a room for a post-office which does more business than any other post-office in the State of Kansas.

I write to suggest that you enlarge the building by adding a third story. If this should necessitate the omission of heating-apparatus from the estimates, I think without doubt this could be provided for at the next session of Congress. It would certainly seem advisable that the Government should erect such a building as would meet not only present but future wants in a satisfactory manner. Respectfully, yours, P. B. PLUMB.

SUPERVISING ARCHITECT OF
THE TREASURY DEPARTMENT, Washington, D. C.

The Senator from Kansas, who led in these censorious comments on the Supervising Architect of the Treasury, is the Senator who signed that letter; it was under his advice and under his suggestion that any change which has taken place in the process of construction has occurred.

Mr. Plumb. — I wish the Senator would point out in that letter any recommendation or any suggestion or hint in regard to the employment or retention of watchmen or other employés about that building.

Mr. Daniel. — It is not my custom to find out in communications things that do not exist; and if the Senator from Kansas would conform himself to the same method of debate he would not have had this reply.

I am not attempting to hold that gentleman up to any reproach for writing this letter. I conceive that it is within the province of a Senator on this floor, or any representative of the people, to give his advice to those who may be in process of executing laws of this character. I do not charge him with usurping any function; but it does seem to me, as a gentleman fair-minded and just towards those whom he criticises, that when the Chief Architect was held up and pointed out as one who should receive public censure, instead of joining with the hounds to run him down, he might at least have taken his place with the hares on that occasion. I do not hold that gentlemen responsible, or say more about him than simply this, that in telling a part of the story it would have been becoming if he had told all.

Now, sir, let us see about this matter of a watchman.

. . . . . .

Mr. Plumb. — Mr. President, there does not seem to be any particular reason why this question should be lugged in at the present time, but if I had had my way about it I should have had the present Supervising Architect of the Treasury brought here under a subpœna *duces tecum*, with instructions to bring my letter, in order that it might be made public. It has no more to do with his employment of watchmen or superintendents of the building at Wichita than it has with the last change of the moon. I am so enamored of that letter on looking it over, that I will ask to have it read again.

The Presiding Officer. — If there be no objection the Secretary will read it.

The Secretary read as follows:

UNITED STATES SENATE, Emporia, Kans., October 4, 1887.

Dear Sir, — Permit me to call your attention to the public building which you are proposing to erect at Wichita. Since provision was made for this building Wichita has grown very greatly, and buildings five stories in height have been erected by private capital. I am informed that the plans as prepared in your office contemplate a building two stories in height merely. This will result in an inferior-looking building. I doubt also if the necessary room can be provided in a building of two stories, as you perhaps know there is a United States land-office at Wichita, and United States court is held there, and there will need to be a room for a post-office which does more business than any other post-office in the State of Kansas.

I write to suggest that you enlarge the building by adding a third story. If this should necessitate the omission of heating-apparatus from the estimates, I think without doubt this could be provided for at the next session of Congress. It would certainly seem advisable that the Government should erect such a building as would meet not only present but future wants in a satisfactory manner. Respectfully yours, P. B. PLUMB.

SUPERVISING ARCHITECT OF
THE TREASURY DEPARTMENT,
Washington, D. C.

Mr. Plumb. — I reiterate all I there said. Wichita is a city of 40,000 people, and it is a better town than any other town in the world outside of Kansas having twice the number of people. There is more activity in business, more business transacted, more necessity for a public building in Wichita than in any town in the United States outside of that State possessing 100,000 people.

The Congress of the United States was guilty of the worst kind of parsimony in providing for a building at that place to cost only $100,000. I was noticing the debate in another place the other day on a proposition to erect a public building at Birmingham, Ala., and it was stated with a flourish of trumpets that the postal receipts of that city were $36,000 a year. The proceeds of the post-office at Wichita are more than twice that much. Another branch of this Congress has voted $300,000 to erect a public building at Birmingham, on the basis of the gross postal receipts of $36,000, while it was only willing to go $100,000 for the public building at Wichita. Since the time when that appropriation was made for Wichita single buildings have been erected in that city costing $150,000, and when we consider the extravagance which the Government always indulges in in the building of public buildings it is readily to be seen that a building which would cost the Government $100,000 could not be in any possible way more than one quarter the size of a building which private parties would build with $150,000.

Therefore, observing that the Government was about to erect a building in Wichita, not only inferior in character, but not up to the average of the business blocks in that city, I said to the Architect I thought on the whole he had better put on another story; but I omitted to say, as the Senator from Virgina did not seem to observe, that I thought he ought to keep up the quota of watchmen while he was waiting for an appropriation.

What I said about the Wichita building in the debate which is referred to here was merely an incident of what I was saying about the Library building. I do not intend that the Senator from Virginia, acute as he is, shall take me away from that fruithful subject. I do not mean that he shall get me into a contemplation of some practices of the office under preceding administrations, and thereby divert attention from what has been going on under this Administration in regard to the Library building in the shadow of this Capitol.

It was not a very heinous offense to keep a superintendent and watchman at Wichita, notwithstanding there was neither Government building nor Government property there, and I freely say that, so far as I have observed, he has economical tendencies. How soon he will get over them I cannot say. I think, on the whole, he has introduced some economies in the management of his office.

I had a talk with him on the subject of the watchman and superintendent being employed at Wichita. He said to me in substance, "If you want a superintendent and watchman kept there you will have to write me a letter recommending it." I said, "I do not think they ought to be kept there, and consequently I will not recommend it." He then said to me by way of palliation, very well illustrated by a story which I will not tell, that he would reduce the salaries, and consequently the offense of keeping them would not be a very large one.

I think that he intended to reduce the expenses of that building to the minimum. I believe he is sincerely desirous of economizing as far as possible in the expenditure of the public money. He cannot go too far, so far as I am concerned, in that direction. If he only spends in a judicious way the money that Congress appropriates, there will be no cause of complaint. But while this officer has been in office only six months the Administration which is responsible for him has been in power for over three years, and it will not do to say that because it has retained in office men whom it found here prior to that time somebody else is responsible and not the Administration.

But the matter of watchmen is not so conspicuous in the Wichita building as it is in the Library building. I have in my hand the report of the commission created by law to erect a Library building, and I find that in one year, in a single twelve months, that commission spent for watchmen $2,772.95.

The Pension building has been referred to sometimes in debate here, not always with words altogether complimentary for its architectural proportions, but it cost $800,000 and was nearly five years in building. The entire amount expended for watchmen during the nearly five years that building was in process of construction was only $2,711.10. In other words, there was expended for watchmen about that building during the nearly five years it was in process of construction less money than has been expended in one year — I will not say in the process of the construction of the Library building, because its construction has not yet commenced. Why, Mr. President, the plans for the basement for the Library building have not yet been drawn.

Mr. Voorhees. — That is not true.

Mr. Plumb. — It is true.

Mr. Voorhees. — I say it is not true.

Mr. Plumb. — I say it is true.

Mr. Voorhees. — I say it is not true, of my personal knowledge.

Mr. Plumb. — They will not be ready until to-morrow.

Mr. Voorhees. — I say they have been ready for six months.

The Presiding Officer. — The Senator from Kansas is entitled to the floor.

Mr. Plumb. — I am informed on what I believe to be good authority that there is an advertisement in one of the city papers stating that the plans or specifications for the foundation of the basement of that building are not completed, and will not be until to-morrow.

Mr. Voorhees. — There is no such statement in any advertisement in any paper in the city.

Mr. Plumb. — I am informed, upon what I believe to be a good authority outside of that, that when a few days ago the Secretary of the Interior came to consider the question of letting the contract or of advertising for a contract for the basement of that building, he

was informed that the plans and specifications for the basement had not yet been drawn.

Now, of course, I am not going to dispute with the Senator from Indiana in a way involving his veracity. He is unduly sensitive about this matter. I do not know that he has any more responsibility about it than I have. He has chosen to defend some things, and he is welcome to his defense; but so far as responsibility is concerned, I do not understand that he has any more responsibility than any other member of this body, or any other member of Congress, so far as that part of it goes, unless he makes himself so. If he proposes to defend these expenditures, then, of course, he becomes responsible. But what he says as of his own personal knowledge I will not dispute.

I said, and I repeat, that I have been told upon what I consider to be perfectly good authority that the plans and specifications for the basement story of that building have not yet been drawn, and I was told that I could find in a city paper, if I would look for the evidence of that fact, an advertisement made for contracts, stating in substance that plans and specifications would be furnished on the 8th day of March, which is to-morrow.

I am not going to say that it does not take more watchmen under this Administration than it did under former ones. There may be more to watch; there may be more necessity to keep on hand a big corps of men to see that somebody does not carry off the property or something of that kind; but the fact is, as I have stated, that on this Library building during twelve months $2,772.95 were expended for watchmen, while on the Pension building, which cost $800,000 and was in process of construction nearly five years, the entire amount for similar services was $2,711.10.

I have here a list of the employés of the Library building whose services cost last year nearly $29,000. A secretary cost $1,800; the messenger cost $600 a month; an accountant cost $1,500.

Mr. Voorhees. — No messenger ever cost $600 a month.

Mr. Plumb. — Sixty dollars a month I said, or meant to say.

Mr. Voorhees. — You said $600 a month.

Mr. Plumb. — Did I? Mr. President, I wonder he did not cost $600 a month.

Mr. Voorhees. — I wonder the Senator did not call it $6,000 a month.

Mr. Plumb. — In view of the wide field opened by this expenditure, I wonder myself the commission did not think it should be paid $6,000 per month on this work. It would have been a hundred times more judicious expenditure of public money than some I have evidence of here.

The disbursing agent cost $2,500 per annum. A man to help him cost three-eighths of 1 per cent, amounting to $253.23. Then the architect cost $5,000. Of course he had to have some one to help him, and he cost $3,000. Then there was a computer, who cost $125 a month, and then there was an expert in iron-construction at $6 per day. In iron-construction, Mr. President! Why, all the ironwork over there is not only in the imagination, but is in the bowels of the earth. An expert in iron-construction at the Library building, which consists up to date of a hole in the ground! No contract was let for anything beyond the footing-course for the walls. He and the civil engineer cost $6 a day each, an expert in heating $6 a day, and another expert in iron-construction cost $7 per day; a draughtsman cost $7 per day, and the plans for the basement are not yet drawn! Then there is another person who was employed as draughtsman at $5 a day, and another draughtsman at $4 and $5 per day. Whether that meant $9 per day, or whether he was worth more some days than others, I am not prepared to state. Another draughtsman cost $5 a day, and another one cost $3 and $4 per day. Some days I suppose he was better than others. Another draughtsman cost $2 a day, and then another draughtsman cost $125 and $150 per month. I suppose he was employed on the evolution plan, so to speak. They got better as they went on; they were more competent to do that nothing which the commission seemed to be determined upon doing. The further they got the longer they were employed; certainly the less chance there ever was of having a building, their services becoming more ornamental and less useful, and consequently they were entitled to greater pay.

Mr. Hale. — What is the item the Senator read in regard to a disbursing officer?

Mr. Plumb. — There was a disbursing agent at $2,500 per annum.

Mr. Hale. — What has the disbursing agent to disburse?

Mr. Plumb. — If the Senator had looked at these figures he would see that the disbursing agent has been the most laboriously occupied of all the persons employed about that building.

Mr. Hale. — In paying these employés?

Mr. Plumb. — He has disbursed $98,000 during the past year. All that has been done over there, it seems, is the disbursement.

Mr. Hale. — For which he has had $2,500.

Mr. Plumb. — That man, in comparison with the other persons employed there, ought to have received $10,000.

Then there is a clerk at $120 per month. Then there is another clerk at $120 per month; there is another messenger at $60 a month; another one at $2 a day, and a sculptor at $5 a day.

That is the list of the employés, the total compensation for which amounts to $28,839.88, and does not include the watchmen, who received during the same period $2,772.95. I am willing to admit that any possible condition of things existing in Wichita is a mere bagatelle by comparison with what has been going on here under our very eyes. If the Architect of the Treasury had been intending to follow the example which has been set by the Library Commission there would not have been anything left of the Wichita appropriation of $100,000 — not a dollar — it would all have been gone.

But as the Senator from Louisiana says, very properly, he has had nothing whatever to do with these expenses. I think I am willing to go further, and I say in view of the letter which was written to him by the member of the House representing the district in which Wichita is situated, that he was fairly warranted in maintaining for the time being a force there in anticipation of an appropriation which may or may not come.

One thing, however, I have observed, that whenever any Republican on this floor or elsewhere has anything to say about any mismanagement or extravagance on the part of this Administration, some one turns around and says that all grows out of the fact that some Republican had something to do with it. I have heretofore spoken of that as pleading the baby act. I cannot think of anything more expressive than that phrase. Who is responsible for the Republicans who are in office to-day. Of course, I think on the whole it would be pretty well to follow Republican advice, but to say that because certain persons are in office who are members of the Republican party relieves the Administration from responsibility is going too far.

Mr. President, I do not intend to work this deposit out now. I intend to keep this thing on hand. I have only just simply got under the cover. When I look at the milk in this cocoanut, when I contemplate all this array of figures from the advertising in the newspapers, the taking down of the houses, the cleaning away of the material at the expense of $13,000 at a return of about $2,000, the erection of a carriage-house for the architect, the fitting up of the blue-print room, and so on, I realize that I cannot do the subject justice at one effort, nor perhaps at twice trying. So I think I will leave the balance of it until further debate. Whenever the debate shall lag, and whenever my friend from Indiana shall have gotten into that good humor for which he is proverbial and can bear a little more, I think I will go further into this great mine that has been opened up here in regard to the construction of this Library building, which is so dear to his heart, for which he has labored so many years of his public life. I was not on his side, but still I responded most thoroughly in my admiration for him in his faithful, eloquent work to bring about the erection of a Library building, and the surprise I have is that there is nothing now but a hole in the ground after this great expenditure of public money in place of a building.

. . . . . .

The Presiding Officer. — The question is on the amendment of the Senator from Ohio [Mr. Payne].

Mr. Voorhees. — Mr. President, if any one expects that I rise to make any extended reply to the remarks of the Senator from Kansas [Mr. Plumb] he is mistaken. I am not in condition to speak to-day, and I do not desire to do so. If the Senate has a disposition to allow the genial Senator from Kansas to amuse himself by an assault of this kind on those who have charge of the work of the new Library building——

Mr. Plumb. — Will the Senator allow an interruption?

Mr. Voorhees. — Oh, yes.

Mr. Plumb. — Here is the advertisement to which I referred:

Office of the Commission for the Construction
of the Congressional Library Building,
No. 45 East Capitol Street,
Washington, D. C., March 1, 1888.

Sealed proposals will be received at the office of this commission until 12 noon on the 31st day of March, 1888, for furnishing the dimension stone required for the walls of the cellar or sub-basement story of the Congressional Library building, to be constructed in Washington, D. C., upon the form of proposals and in accordance with the specifications and plans therefor. Copies of specifications, etc., will be furnished to intending bidders on application to the architect at this office, and detailed plans of the same may be seen at the same office on and after Thursday, March 8, 1888.

William F. Vilas,
Edward Clark,
A. R. Spofford,
Commissioners.

Mr. Voorhees. — You will find the advertisement says that bidders can have the specifications to-morrow, but it does not say they are not prepared.

Mr. Plumb. — No, but it is significant that they are not already prepared.

Mr. Voorhees. — Everything is significant to the Senator from Kansas.

Mr. Plumb. — The advertisement bears date the 1st day of March. It was published on that day —

Mr. Voorhees. — Please get through. I am tired.

Mr. Plumb. — I will get through now or some other time.

Mr. Voorhees. — It does not make any difference to me.

Mr. Plumb. — It is a little bit significant and I think supports the allegation which I made, that for seven days after the advertisement was printed the specifications could not be seen in the office of the architect.

Mr. Voorhees. — The Senator from Kansas said I was sensitive in regard to this matter, as if I was more responsible than others on the subject. I confess to the fact that this building for the Library is a favorite measure with me, but I stand charged with no more responsibility about it than any other Senator here. It is now eight years since the committee to which I have the honor to belong was created to take in hand the subject of the erection of a library competent to take care of our great wealth of books. The Senator from Vermont

[Mr. Morrill], on whom I look as a father of this great measure, had for years before been engaged in it. We have worked together from that day to this the best we knew how. It took us six years before we got a law through both branches of Congress. The law had all manner of attacks. In fact, there were a good many men, some in this body and perhaps some in the other, who did not want a shelter for the Library, possibly for the reason that they did not need books.

I do not remember that we had the support of the distinguished Senator from Kansas for the original proposition to have a Library at all, but be that as it may, when we passed the bill for the erection of a Library it was after the utmost care and consideration by a committee of five gentlemen from this body, and perhaps the same number from the other House. It was not done in haste, not done in a corner, but considering everything in connection with it, we thought it was best to intrust the construction of the Library building to a commission, to be composed of men who were well known, and must necessarily be men of high character.

I hope I may have the attention of the Senate, because the question turns upon this very point that I am stating. In the law which passed Congress and was signed by the President, it was provided that the construction of the building — which covers everything, covers the employment of skilled labor and of common labor, covers the question of purchasing materials, of contracts, and all cognate questions — should be committed to a commission consisting of the Secretary of the Interior, who, while the incumbent may change in that place, would naturally be supposed to be an honest man and was an honest man when this bill passed, two years ago. It will not do to say that the Secretary of the Interior then or now would connive at dishonest practices.

Then who was the next commissioner named to take charge of the construction of this great building? It was Mr. Spofford, the Librarian of Congress. I have known him almost thirty years. He was appointed here by Abraham Lincoln, and if the Senator from Kansas can convince the country and can convince the Senate that Mr. Spofford is an improper man to have charge of a work of this kind, and would allow improper charges and waste the public money, he will have more of a task, I think, than he has bargained for. The next man named on that commission was Edward Clark, the honored Architect of this Capitol. We have all known him a long time. I want to justify the action of the committee of which I am a member, and justify the two branches of Congress to everybody, except the Senator from Kansas. I despair of doing that to him. But we thought that these three men might safely be trusted with the expenditure of the public money upon a building of this kind.

Were we mistaken or not? I am not going into the intricacies of how much was paid for a watchman, a little more or a little less. There may have been one or two salaries paid that are too high here. I think perhaps in one instance a man is paid beyond the duties of his position, but that is a small matter and a matter of opinion. The three men composing the commission are men of high character. They have absolute control on this question and they have the employment of the architect. He has no power except as an architect employed to furnish designs, plans and specifications. He can not receive a bid; he cannot make a contract; he cannot judge of material even except subject to the commission, and it seems strange to me that a Senator rises here with a paper in his hands to pick out a little bit here and a little bit there and to expose expenditures that are necessary and that took place in the beginning of the work. All these expenditures, with every step in the progress of the work, have been under the charge of men whom you and I and every one of us would trust in any and every affair of private life.

What is more, I say if there has been malfeasance in office there, it would be a mostamazing thing to me, for these are among the most perfect men known here — the past and present Secretary of the Interior, Justice Lamar and Mr. Secretary Vilas. The Senator from Kansas, for the first time I ever heard it going into party politics, drags into this matter the Democratic party and the Republican party. We have never remembered that there were parties when discussing the Library bill. We have never remembered that there were parties in our Chamber when we have met in our committee-room and considered the question. But if that be a thing to be mentioned here, allow me to say, and I do it with the greatest possible respect, that two of these commissioners, Mr. Spofford and Mr. Clark, are pronounced, square, out-and-out Republicans, and I respect them as such, for I want no neutral tints in anybody's politics. So far as I am concerned, if a man belong to a party let him be there.

Here, then, are three commissioners; one of them, it happens for the time being, is of one party and two of the other party, but I care not a fig about that. I have divested myself largely of care on this subject because I have felt secure in the men in whose hands this whole business is confided. I have not felt that it was necessary for me to hunt up whether this dollar or that dollar was wrongfully spent because I felt that I could go to bed at night trustfully and confidently that matters would be right to-morrow morning, and if there are any discordant elements that creep in in connection with the construction of this building, I know the men who have the honor to compose the committee of the Senate desire to meet such questions with honesty, economy and candor, and push on the work on this building as rapidly as possible.

It is unfortunate that material was offered that was found not acceptable to the commission. We heard of no trouble until that question was raised, and if I desired to say any unkind thing, which I do not, to the Senator from Kansas (and he knows I do not), I would say that it was singular what a noise and trouble one discontented contractor can make, and if every time a man offers a bid which is not accepted such a racket as this can be raised, we may despair of ever having a Library.

Allow me to say a word further, Mr. President. This is a great work. I had occasion to talk a little the other day on this floor about it. I repeat myself when I say that it is 21,000 square feet a larger building than the State, War and Navy Department building. The law for the construction of that building was passed in 1872, nearly sixteen years ago, and it is just finished. The Bureaus of the War Office have just moved into it. This building, as I say, is 21,000 square feet larger. It is the largest building the Government will own except this Capitol, and it is more than two-thirds as large as the Capitol. It will be the largest Library building on the globe, and will be an honor to this country when it is erected.

I have devoted time, labor, thought, and enthusiasm to this question, and my greatest hope, in which I know my distinguished and beloved friend from Vermont [Mr. Morrill] joins me, is that we may live to see its spire reach the sky and see the books of this great Government housed in it, and the accumulations of the age added to it. When that shall be done, the small bickerings and fault-findings of the present hour will be forgotten in the joyous feat that has been accomplished.

I have no fears of the future. I believe this work is in the hands of honest men, and when I believe in a man's honesty I feel secure.

Mr. Plumb. — It will be news, I think, to the Librarian, Mr. Spofford, that he is a Republican, but in the mutations which are going on in the political world ——

Mr. Voorhees. — I care not whether he is or not; he is an honest man, appointed by Abraham Lincoln. I supposed he was a Republican and suppose so yet.

Mr. Plumb. — I have no doubt he is an honest man, but the Senator from Indiana is certainly not going to say that on account of any eminence of this Library Commission they are to be left to expend money at their will.

Mr. Voorhees. — Undoubtedly not. If you can make it appear that they have spent a dollar and a half apiece wrongfully, we will call them to account.

Mr. Plumb. — That is exactly what I am coming to. I propose to criticise, and I suppose the Senator will think it just that I should criticise ——

Mr. Voorhees. — I will call a meeting of the committee and ask the Senator to come before it to show wherein anything is wrong. This committee is not here to cover up wrong.

Mr. Plumb. — I think on the whole they have had something to do, as shown in their report, and I have a right to refer to what has been done under their auspices and control. The fact that they are eminent and honest men does not relieve me from my responsibility in regard to the expenditure of public money which I vote.

I have had nothing to say about any contract. The Senator from Indiana seems to have got it into his mind that there is some contract about which I am concerned. I do not know any contractor and do not know anything about any contractor in connection with this work. I simply spoke of expenditures not relating to any contracts, not relating to construction, and said they were of a kind which have been extravagant and almost, if not wholly and totally, unaccompanied by any result to the Government, and I so characterized them. If the Senator wants to commend the commission because they have dealt harshly with contractors, I have no objection; that is his business and not mine.

If I were conscious of a desire for a long life, I should join most heartily in the aspirations of the Senator from Indiana that I might live long enough to see the spire of the Library raised to the skies. I never expect to see it.

Mr. Hale. — Mr. President, now let us go back to the bill itself and have a vote on the amendment offered by the Senator from Ohio.

The Presiding Officer. — The question is on the amendment proposed by the Senator from Ohio [Mr. Payne].

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE ON BERKELEY STREET, BOSTON, MASS. MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

[Gelatine Print issued only with Gelatine and Imperial editions.]

HOUSE FOR DR. GEORGE M. HAYWOOD, ROCHESTER, N. Y. MR. C. S. ELLIS, ARCHITECT, ROCHESTER, N. Y.

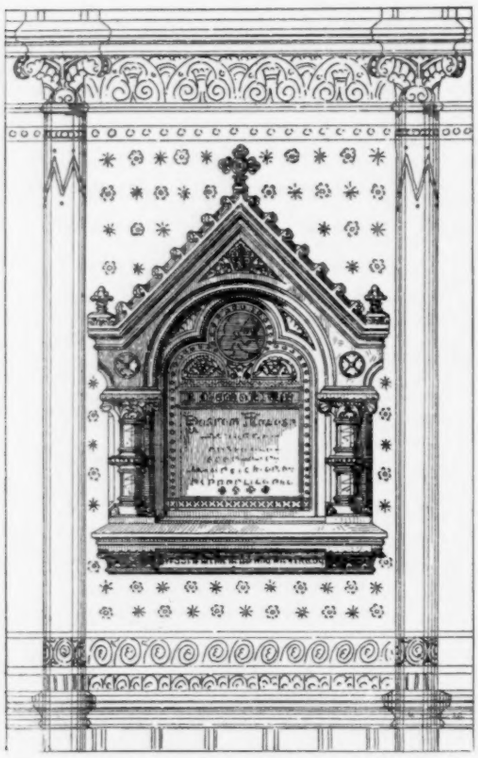
CHEAP HOUSES AT PASSAIC, N. J., LITCHFIELD, CONN., AND LARCHMONT, N. Y. MR. F. E. WALLIS, ARCHITECT, NEW YORK, N. Y.

THE finish of all of these houses is either pine or white wood, cherry stain. In house at Litchfield the "Den" fireplace is to be built of field boulders and with large opening; in other houses of fire-brick.

BOSTON & ALBANY RAILROAD STATION, SPRINGFIELD, MASS. MESSRS. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, BOSTON, MASS.

COMPETITIVE DESIGN FOR A VILLAGE CLOCK-TOWER BY MR. T. WALSH, BOSTON, MASS.

To this design was awarded an honorable mention in the recent competition of the Architectural League of New York.



Design for Mural Tablet. M. N. Cutter, Architect, New York, N. Y.

AZTEC ANTIQUITIES.

A GREAT many persons, says the New York *Commercial Advertizer*, have seen and everybody has heard of the Charnay-Lorillard collection, presented to the National Museum by the liberal New Yorker, but comparatively few know anything about the Abadiano collection which stands side by side with it in the museum. Very few, perhaps, of the large number of people who daily stroll through the buildings of this and similar institutions know the personal history connected with many of the curiosities on exhibition. Many of these unwritten stories are full of romance; they tell of perils encountered and surmounted, of great self-denial and hardship, and of private fortunes spent for the furtherance of science.

There is now en route to this city a gentleman who has spent many years in the study of American antiquities. He was the projector of the Abadiano collection, which bears his name, and negotiations will be opened with General Di Cesnola, of the Metropolitan Museum, which may result in the casts being brought to New York. Wendell McLoughlin, of the Erie Railroad Company, accompanied Abadiano in his journey to the ruins and assisted in taking many of the casts. Mr. McLoughlin tells many interesting facts of the struggles of the young Mexican antiquarian. Referring to the collection recently, Mr. McLoughlin said:

"The casts are splendid specimens of art, and bring out the characters engraven on the original stone wonderfully well. Their value to history can hardly be over-estimated, for if anything more is ever to be learned of the Aztecs it will have to come through these voiceless monuments. The large collection of manuscripts were nearly all of them destroyed by the zealous priests who accompanied the Spanish conqueror, and thus the thread that bound an enlightened nation to the history of the world was ruthlessly snapped. The monuments narrowly escaped the fate of the manuscripts, and many of them show the marks left by axes in the hands of ignorant zealots nearly four hundred years ago. But they were, fortunately, for the most part saved, and it is to be hoped that a key to the hieroglyphics chiselled on them may yet be discovered, and thus a new and important link added to the chain of history."

"Is there any movement in that direction?"

"Yes, there is, but it is as yet in its infancy. Nothing can be done until all of the collections on the Continent and in this country are brought together, thus enabling the student to make an intelligent study of the subject and in time to discover the real theory. This is the idea of Abadiano, and he has the co-operation of many of the most prominent scientists of the day. He is an enthusiast on the subject, and has spent a great part of a handsome fortune in carrying it out. Mr. Lorillard is still interested and willing to continue to help, but the burden is too heavy to be borne by half a dozen."

"The story of the collection must be an interesting one, judging from the adventures of Désiré Charnay," was suggested.

"Not only interesting, but romantic," was the reply.

"The career of Abadiano, and the way in which he came to make the collection is curiously identified with the history of Mexico under Diaz. The dashing revolutionist and the young antiquarian were, strangely enough, intimate friends, and Abadiano was an officer in the Diaz army when the latter was striving to wrest the government from Lerdo — the rightful president. The two young men fought and slept and eat together, and when they had succeeded in their efforts and Diaz was proclaimed ruler, the young antiquarian retired from the army and returned to his home at the capital. Here his family had for more than two hundred years conducted a large book store and he, together with his brother, now took charge of it. But his antiquarian tastes and his service in the army had unfitted him for a business life and he soon withdrew from the firm. Diaz had promised him an appointment if the revolution succeeded, and he now asked for it; but the office offered him was so much smaller than he thought he had a right to expect that he would not except it. General Diaz then suggested that he make a collection of antiquities and agreed to pay all expenses. There was some delay about getting an appropriation and so impatient was Abadiano to begin that he advanced the money from his own purse. He put his whole soul in the work and determined to make the casts by the most approved method."

"Was it the same as that used by Charnay?"

"You would hardly need ask had you seen them side by side," answered Mr. McLoughlin. "The most unpractised eye can discern the difference. In the Abadiano cast you would notice that every little crack and crevice, even the grain of the stone, is brought out with the greatest distinctness. It was done by what is known as the gelatine process, and it is very expensive, especially in a country like Mexico, where the material is scarce and has to be bought in small quantities at the drug stores. The stone of which a cast had to be taken was first securely boxed and the hot gelatine poured into the vacant space between the box and stone. One can imagine the difficulty of making a cast when one takes into consideration a stone weighing twenty-five tons imbedded in the walls of a church, perhaps sixty feet from the ground, as was the famous calendar stone. A scaffold had first to be built, the high stone nicely divided and the cast made piece by piece."

"What was Charnay's method?"

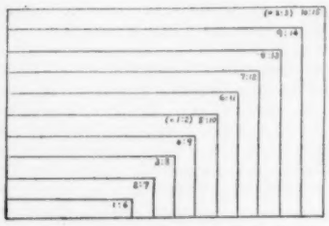
"It was a very simple one, and the most unlearned eye can see that it was very inferior to the more expensive one used by Abadiano. A piece of common brown paper was first dampened, then laid carefully over the stone and hammered until an impression of the characters was made. This was continued until the layer of paper was perhaps a quarter of an inch in thickness. Then it was left to dry and in time a cast made in plaster-of-Paris. Charney made many failures and was only partly successful in the end. His collection consists entirely of flat surfaces, such as friezes and medallions, while the more important monuments, the gods, the columns and statues, were left to Abadiano."

"How came Abadiano's collection to this country?"

"Abadiano's work was almost completed when a tide of misfortune suddenly overtook him. After he had made two casts and destroyed his gelatine plates, the Mexican government, in a spasm of reform, decided that the expense would be too great and declined to reimburse him. This was a terrible blow, but Abadiano decided to finish the work, hoping that his friendship with Diaz would make things all right. But they quarrelled, and he decided to carry the collection to the New Orleans Exposition, then just on the eve of opening. On arriving in New Orleans, he did not place his collections in the exposition, for he had been at great expense and this would bring him in no revenue. He rented a large store in the French quarter and there set up his casts. But so slowly did the careful antiquarian work that by the time he was ready to exhibit the exposition was nearly over and many of the visitors had left the city. At this juncture, Professor Mason, of the Museum, effected a temporary arrangement by which the collection was sent to Washington. If the Metropolitan Museum succeed in securing it, a most interesting feature will be added to the institution."

Pure Air Indicator. It is estimated that the air in a room becomes distinctly bad for health when its carbonic acid exceeds one part in 1,000. An apparatus has been recently patented by Prof. Wolpert, of Nurnberg, which affords a measure of the carbonic acid present. From a vessel containing a red liquid (soda solution with phenolphthalein) there comes every 100 seconds, through a siphon arrangement a red drop on a prepared white thread about a foot and a half long, and trickles down this. Behind the thread is a scale beginning with "pure air" up to 0.7 per 1,000 at the bottom, and ending above with "extremely bad" 4 to 7 per 1,000 and more. In pure air the drop continues red down to the bottom, but it loses its color by the action of carbonic acid, and the sooner the more there is of that gas present.—*Scientific American.*

PROPORTION IN ANGULAR, ROUND AND POINTED STYLES OF ARCHITECTURE.



Scale of Oblongs — (Parthenon Proportions)

TO those who have been observers of the world for their half century nothing is more impressive, it might almost be said oppressive, than the sense of its marvellously-increased populousness. "The full tide of human existence," which Dr. Johnson was familiar with at Charing Cross was visibly rising thirty years ago, but even then was moderate indeed compared with the high flood which now hurries and crowds along its thoroughfares widened as they are. The business and even ordinary occupations of men have undergone like cumulative complication. Effects due to such vast changes are necessarily traceable in the architecture of our day. Whatever public functions have to be provided with house-room, demand is made for vast space and combination of a multitude of subsidiary conveniences. The Law Courts may perhaps be taken as an example of how these conditions appear to be inimical to concentrated composition.

The theory of composition as laid down by the teachers of a former age enjoined that the conspicuous limits of a complete design should be included if possible within the general outline of some simple geometrical form. Hence, in painting, that "principle of the pyramid" which controls the groups of Holy Families by so many of the greatest Italians — Leonardo, Fra Bartolommeo, Raphael, Titian. This particular principle is one of many which have been similarly applied both in Classic and Gothic architecture. The general principle is becoming, for the reason given, more difficult of application every day; the more reason is there for endeavoring to penetrate to the true and full capabilities in variation of the harmoniousness of associated geometrical forms in all styles of architecture. It seems not impossible to evolve from study of the simpler problems of the past some guidance which may be available in the more comprehensive problems of the present day. Such an inquiry is bound to take equal note of Grecian and Gothic style.

The most characteristic form of Greek architecture. which for the most part is Greek templar architecture, is the oblong or rectangle. The chief proportions employed apply to relative lengths of lines at right angles to each other; this is the case in the plan of the general stylobate, of the cella and its sub-divisions; the long horizontal line of the cornice on fronts and flanks are in like relation to each other and to the height of the order, and the axial lines of the columns form oblongs of various proportions as falling into comparison with the variable distances of interspacing. Hence it is that the harmonious effect of the Parthenon is effected by the interplay of proportions between lines for the most part at right angles to each other. Oblongs are employed which were taken by Ictinus, the architect, from an advancing sequence, gradually approaching an exact square, but from among the infinite number of these a scale is adopted, with many analogies to a musical scale, by selecting for employment only a few, and those not too close together on the one hand, nor on the other with such gaps between them as to lose the advantage of sense of connection and interdependence. The sense of unity is further combined with pleasing relief of variety by the employment of the same selected proportionate oblong, sometimes in plan, sometimes in elevation, and in different dimensions.

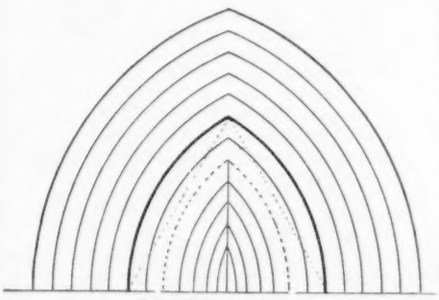
The oblong plan of the temple on the top step has exactly the proportion of breadth to length of 4 : 9, viz.: 101.341 front: 228.-141 on flank (error 0.12). The same proportion is repeated in elevation in the well-marked definition of breadth of top step — the hundred attic feet — and the height from this step to the top of the horizontal cornice (error 0.0034). It will be observed that this is a case of continued proportion. The measurements are taken from Penrose's "*Athenian Architecture.*"

The proportions of the same oblong again apply with slightly different dimensions to the side walls of the interior of the naos, then again to the lower diameter of the column compared with columniation, that is, to the extent from centre to centre of adjacent columns, which decides the important principle of spacing.

Again, by a correspondence far too precise to be fortuitous, the interior plan of the naos which lodged the colossal chryselephantine statue of Athens is an oblong of the proportion of 9 : 14, and the same proportion corresponds exactly to the full height of the façade to its breadth, so that, in fact, the elevation of the temple might be drawn accurately to scale on the pavement of the naos and would occupy it exactly.

These are but a few examples of the fundamental principle which I have elsewhere elucidated in detail and shown to have been kept in mind by the architect of the Parthenon as positively as a musician keeps in mind the characteristic selection of notes which constitute the scale of the key in which he is composing. The architectural scale in this particular instance advances by consecutive differences of five. Important applications of proportion are all taken within the sequence: 1 : 6 — 2 : 7 — 3 : 8 — 4 : 9 — 5 : 10 — (=1 : 2) 6 : 11 — 7 : 12 — 6 : 13 — 9 : 14, etc., to the neglect of the infinity of ratios which might be inserted intermediately. That a true principle of architectural proportion is here involved may be confidently assumed from the fact that it can be traced in all the finest works of the Greeks of which we have accurate measurements and always with the result of a pleasing or a majestic harmonious effect.

But Greek architecture is not the only fine architecture in the world, and proportion has its value in all styles. The principle, therefore, is required to vindicate itself by proved applicability to other styles however contrasted with the Greek. It should be applicable therefore to Gothic. It may or may not be possible to prove that the Gothic architects deliberately worked by guidance of such a principle, but wherever a conspicuously harmonious effect of proportion has been achieved by them, it ought to come out under analysis that this general principle has been contributory. This should be as positively the case and for the same reason as is the accurate proportion of the note which an untaught but naturally gifted singer pitches accurately by ear.



Scale of Pointed Arches.

The Greek theory then should be available for the Gothic architect — *mutatis* only *mutandis.*

The questions, however, are forced upon us: What are the *mutanda,* — and how are they to be verified as naturally and rationally *mutata?*

Certain forms of application do not seem to demand any change at all. Both styles have some elements in common and the regulative considerations are identical in both.

The plan of every cathedral is largely resolvable into a combination of rectangles,— squares or oblongs of various sizes, or of oblongs of various proportions. The nave and transepts of Westminster Abbey church with their aisles are thus made up. It will be seen at once, how much effect is dependent upon the proportions adopted for relative breadth and length in both nave and transcept. How great a variety of effects was open to choice becomes apparent at once, by comparison of plans of various cathedrals. In these structures where the interiors were all important, we should expect the proportional norm to be decided by internal lengths and breadths. The greater or less elongation of the nave, the more or less liberal expansion of the crossing, the relative width allowed to a side aisle, all these are matters of proportion whether the designer trusts to his eye entirely and general impressions, or merely works out the conditions of the area and resources at command, or cares to proceed on the principle of reducing the approximate forms which commend themselves to his taste, to precise agreement with systematic numerical proportions. It cannot be indifferent to ultimate effect whether the vaulting of the aisles follows a series of squares as at Winchester, or of oblongs as at Westminster; nor when the oblong is admitted, in what degree it diverges from the square. So it will be observed that these oblongs have a narrower proportion in the aisles of the nave of the abbey, but a more compact in the broader transept. Mere sympathetic sense of appropriateness may have dictated this difference so conducive to harmonious variety; but we have only now to remark that it is one of those which the Greek regulated by precise numerical proportion,— as in the case of the breadths of the ambulatory and the portico of a temple.

The same remark applies to combinations of the three dimensions, height, length and breadth. Who has not found some interiors too low for the length or too high for the width? Those who would see the interior of Amiens Cathedral to the best effect, must divide the height for the eye by ascending to the triforium; there the clerestory windows are no longer hopelessly foreshortened and every moulding tells, as the spectator looks with equal ease upward and downward and to the front. The greatest of Greek architects combined the three dimensions in accordance with schemes of proportion which have much analogy to the numerical ratios of the notes of a musical chord,— though he was not restricted to the ratios which are determined for music by the laws of ærial vibration. Such exactness may not be indispensable in applied proportions, but proportion does not properly exist unless there is a certain approximation to exactness, be it only such as a cultivated eye decides spontaneously.

Other critical proportions in Gothic Architecture which have analogy to Greek, are the width sof nave and of pier arches relatively to height, of mass of piers relatively to interval, and the relative heights allowed to the subdivisions of clerestory and triforium. These latter are determined at Westminster Abbey with a numerical exactness which approaches that which the Greek applied to columns, hypostylic and epistylic. Architectural effect varies importantly with every variation of these and with every variation which is made in those which are associated with each other.

But new resources of harmonious combinations and variations arise when the restriction to right-lines and right-angles in the most important places is renounced, and curves of considerable sweep admitted and that in conspicuous positions.

The most familiar employment of the semicircle is in the arch; all semicircles have in themselves the same simple proportion of diameter to radius — of breadth to height, but taken in combination great variety has been obtained by differences of dimensions as dependent on the width of the openings which they crown, as between tall or broad windows, doorways or pier-arches. We have at one extreme an opening where the semi-diameter which measures the height of the arch may be only a third, fourth or fifth of that of the opening below, and in the other we have examples of wide span where the semi-diameter of the semicircle approaches equality to the height of the supporting jambs below or exceeds it in any proportion. Romanesque architecture went far to exhaust all the varieties and contrasts of this form. The effects were put to proof of pier-arches of various proportions as more or less suitable in different scales of positive dimensions. These were relieved from time to time by contrast of tall and narrow arcadings; then pairs of arches were included under a single containing semicircle, or the arch was enriched by mouldings of sections plane or round in concentric semicircles varied in degree of closeness. Then slender arcading was reduced to mere relief upon wall-surface, and trial was made of the ornamental effect of interlacing arch-mouldings by taking each pillar successively as the centre of semicircles extending to the next adjacent on either side.

Finally, great resources of enrichment were obtained by combining a series of successively diminishing moulded semicircles upon slope lines or splays on the side of a pier or in the thickness of the wall.

Architectural ingenuity, invention, taste and imagination did their utmost to exhaust the combinations of which these elements are susceptible; sometimes accidents or exigencies of construction led to a novel arrangement; at other times construction was modified to enable an original independent caprice to have its opportunity. Each scheme of combination was tried sooner or later in various proportions quite as adventurously, and in various degrees of complexity and of diversified enrichment. Occasional and precarious variety was obtained by employing a segment less than half the circle; otherwise and with more success by more or less stilting the semicircular arch above columns. Still the inevitable sameness of the semicircle set rigid bounds to the passion for elaboration and novelty which had worked resolutely up to the limit. When this was felt to be finally reached, the same impulse carried imaginative art at a very few bounds beyond it. Constructive conveniences and advantages, sometimes enforced and sometimes suggested an incidental employment of the pointed arch. The sense of congruity had been too positively developed in the round-arch system for the random mixture of round and pointed not to offend. The superior capabilities of the pointed arch were also very soon recognized, and the revolution accelerated by all the attractiveness of novelty in a rapidly progressive age, was speedily completed.

These capabilities no doubt partly consist in a special expressiveness of an aspiring form appropriate to edifices dedicated to sacred ceremonies and devotion. It then has other inherent advantages. The proportions of a semicircle are invariable; but there is no limit to the varieties of proportion which may be given to the pointed arch. It trenches on whatever advantages the semicircle may possess by the angle at the apex being reduced within a merest fraction to obliteration; or this angle may be so acute that the width bears the most trifling proportion to the height of the arch. Between these limits variability is infinite, and the widest field was open from which the artist could select any number of special forms most suitable for the embodiment of the idea which he might be striving to turn to shape and endow with a local habitation and a name.

Much of the work of the designer in the new style was simple translation of old forms into the new.

A perfectly developed Romanesque church becomes developed Gothic, by changing the semicircular into pointed arches throughout.

But the simple application of this process brings to light at once the special excellence of the new form and opens up a wide and delightful field wherein architectural genius might disport and accordingly forthwith hastened to disport itself. A new spirit of life was infused into the suits of Romanesque mouldings. Each moulding of such a series which before only repeated the identical semicircular form in altered dimensions, now becomes one in a succession of forms which gradually advance in proportion of width to height. Especial emphasis might be given to some of these mouldings independently or from regard to bearing shafts below, either by section, mass or ornament, but still each would take its place in easy gradation with those above and below it. The outer lines ever approaching nearer and nearer to coalescence with a semicircle.

Pointed arches are thus susceptible of being arranged in regular sequence of acuteness, as oblongs of all possible proportions may be arranged in order as they successively approach nearer to coincidence with a square, as the musical notes producible on a monochord approach nearer and nearer to a repetition of a primary note in the octave. Such an intermediate series is, in each case, naturally infinite; but as the musician makes his selection of notes with reference to a key appropriate to his theme, so the Greek architect selected a limited number of proportions of oblongs suitable for his purpose, and obtained characteristic expression by employing these variously to the exclusion of others; and so it would be at least possible, and in principle reasonable and legitimate, for a Gothic architect to select certain typical forms of the pointed arch as a scale, and to aim at producing a characteristic and harmonious effect by restricting himself to these.

It is not the purpose of this paper to set forth that any particular Gothic building can be proved to have been set out with definite recognition of this principle. This may or may not have been. It is perhaps less likely that this can be proved, than it can be shown that in some cases of admirable result, the forms adopted do prove to fall in with it. Certainly, for example, it is impossible to linger in Westminster Abbey, and not be conscious of a remarkable harmony in the contrasts, as much as in the gradations of the forms of the arches. The very acute arches of the aisles are associated with the broader proportions of the main nave and yet with no effect of harshness, the transitions being relieved by the intermediate forms of pier arches, clerestory and subdivisions of the triforium. On the other hand at Salisbury, the defective arcuation of the triforium, strikes an unmistakable discord.

In the formation of all scales of proportion, whether of sounds, colors or forms, the primary consideration is the determination of a key. This in architecture may be imposed by circumstances, or where these are elastic, must be supplied by imagination prompted and stimulated by apprehension of the spirit of the theme in hand.

Let us suppose that the key adopted is the pointed arch based on the proportions of the equilateral triangle. The repetition of this everywhere only differing in dimensions in heads of windows, in doors and pier-arches, etc., could not but be monotonous. The diagram shows a scheme of forms progressive away from this key in both directions — to breadth and to acuteness. It would, at least, be possible to select from this series a sufficient variety of forms to suit the exigencies of composition, and at the same time favor coherent harmony. The pointed arch of which the height is equal to the span, and is somewhat taller than that which includes an equilateral triangle, is intermediate between the two classes which are in fundamental contrast, those of which the height is greater than the span and the others of which the span exceeds the height. They may be distinguished as the expanded and the acute.

As characteristic effect is always dependent on restriction of variety within special limits, it is consistent to infer that advantage in this respect, may be obtained by adhering in a given composition to one or other of these classes almost exclusively; then, to a certain limit of variety even within the selected class; and, again, by even insisting by emphatic repetition and with diversity of dimensions, upon a particular central form within the range of that selection.

The value and relief of contrast depends largely upon resort to it being only occasional inasmuch as surprise however mild, is an indispensable element of contrast; it will therefore be provided for by the employment, always subordinately but still not unconspicuously, of a few well-marked forms from the class, whether the expanded or the acute, which is not adopted in the first instance.

Apart from the stimulus of such secondary concords the pointed style may droop towards the tameness of the circular. The pedantic adherence throughout Cologne Cathedral to the pointe l form derived from the equilateral triangle, contributes largely with other causes, to the monotony which so soon brings our interest to an end.

It will be observed that the adoption of the pointed arch and arch mouldings did not involve the renunciation of all the beauty which is obtainable from circular forms and sequences. A further source of contrast is obtainable from association of these in circular windows, foils and cusps.

W. Watkiss Lloyd.

Books and Papers.

The value of this new life of Terburg, or Ter Borch [1] as the author calls him (setting an excellent example to those who mis-name persons and places) consists in the new matter that the author has culled, owing to the discovery of some sketch-books of the painter. It was known that a descendant of Netscher had alluded to these albums; but it was by mere accident that they were found by M. Bredius a few years since. Being interested in the 1882 exhibition of works of art at Zwolle (Gerard's birth-place) M. Bredius met with a descendent of Ter Borch's, M. Zebinden, who offered to let him see all the family papers, a mass of drawings and documents. In 1883 M. Van Doornuick published a work giving the genealogy of the family, and the names and dates appertaining to the principal events connected with the Ter Borchs. Shortly after this, M. Zebinden died, and the albums and documents were sold in Amsterdam. But previously to this M. Michel went to Holland, and through the kindness of the auctioneer, M. Scheltema, was enabled to look through the entire collection.

Gerard's father was a painter, and during his travels in Italy was an indefatigable worker; but on his marriage he seems to have thought it prudent to succeed his father as tax-collector, which appears to

[1] "*Gerard Ter Borch. Les artistes célèbres*," par M. Emile Michel, Rouam, Paris.

have been an hereditary office, as at his death he bequeathed it to his son Herman. But he worked at his art as well, and as he married three times and had twelve children, the combination of labor no doubt was satisfactory. Gerard the elder, was a prudent and good man, as we may gather from a letter to his son, when he was in England. "Dear child, I send you the lay figure, but without the pedestal, as it would make the box too heavy, and you can get one made cheaply where you are. Use the lay-figure more than you did here. [That is questionable advice.] Draw much, large compositions full of movement, and if you want to paint, choose modern subjects which take less time to do. [Wise this advice, considering the heroic and sacred style of the day.] Paint freshly that your colours may harmonize well. . . . Above all, serve God. Be honest and humble, be useful to all, and your work will go well. I send you your coat, your garters, some shoes and laces, a ribbon for your hat, six cravats, six handkerchiefs, and two caps. Take good care of your linen that nothing may be lost." Then follows advice about mending his clothes, a piece of cloth being enclosed for the purpose. "I also send you a case full of long brushes, quite new, two quires of paper, some black chalk, a collection of good colours and six pens like those used by Matham [a celebrated engraver]."

Gerard was the eldest son, and showing a taste for drawing, the father took pains with his education. Two of his younger brothers, Moses and Herman, and his sister Gesina likewise inherited the father's artistic tastes. Indeed, the latter's drawings, reproduced in M. Michel's book show more than a mere taste, they are masterly sketches. Gesina was also a musician and writer of verses, according to the fashion of the day. Her portrait, by herself, is that of a *piquante* little face, with a *nez retroussé* and a crowd of little curls encircling her head. Moses also was a clever sketcher, but with a craze for soldiering and getting a commission in the Dutch fleet, at that time sailing for the Thames, he was killed in sight of "*Harwick sur la Tamise*," which I presume the author has miswritten for Harwich. Moses's portrait by his sister is that of good-looking young fellow, with long hair and dressed in the elegant man-millinery of the period. One of Moses's sketches bearing the name of Jan Fabres, reveals to us the identity of a personage in several of Gerard's pictures, which was engraved by Bartsch as a portrait of Ter Borch, and placed by Charles Blanc at the head of his biography of the painter. The "Leçon de lecture" of the Salle Lacaze in the Louvre, by Terburg, and a drawing (also in the Louvre, No. 536) by Netscher, contain portraits of this same Jan Fabres. Gesina seems to have survived the rest of her family, for she was living in 1690. She never married. After having had many admirers without returning their passion, she became engaged to Hendrick Jordis, sentimentally carving upon a tree his initials, and "*Vive le cœur que mon cœur aime*," in French; but, unfortunately, soon after, the young man became suddenly insane, and thenceforward art became her only lover.

One of the sketches in M. Michel's book dated 1628, of the family at dinner, is almost too clever for a boy of eleven years of age, and it is scarcely credible that it was the work of Gerard at that time; but another sketch is, no doubt, authentic as it is inscribed, "My Gerard did this drawing from Nature at Zwolle, the 24th April, 1626." This was two years earlier; and if the "Family at Dinner" is really the child's work, it shows enormous progress in the time. Nothing came amiss to the boy; he sketched everything, soldiers, landscapes, ruins, sports on the ice; and perhaps it is in this, that he excels beyond his contemporaries. We ordinarily only know Ter Borch by his satin gowns and lutes and furred jackets; but M. Michel gives us some sketches of soldiers, and "La Rise," which show him in a new light. Indeed, his greatest work, the "Peace of Münster," proves him to be best of the Dutchmen, and much more than a mere painter of satin. Not only are the difficulties of composition wonderfully mastered in the "Peace of Münster," but the individuality of the different types of men and the various expressions of their faces, are marvellously rendered. Whether Ter Borch learned how to treat grays from Velasquez, we cannot tell; he travelled in Spain, but is is said during the absence of the Spanish master. However that may be, in delicate coloring and precision of touch there is a certain similarity between Ter Borch and Velasquez. His successors, Metsu, Dow, Mieris, and his pupil Netscher, are all his inferiors; alone of the Dutch school, de Hooch, can be compared to him as a colorist. That he was before all things a Dutchman, is to his credit; he painted what he saw, often, in its supreme ugliness; but both he and de Hooch were content with nature. Their imitators, on the contrary, idealized.

M. Michel traces the history of the "Music Lesson," in the Peel Collection of the National Gallery. He imagines it to be the one sold in 1760 at Amsterdam for 196 florins, in 1762 for 230 florins, and in 1765 for 990 florins.

Thence forward he gives its history thus:

1767, sale of Julienne collection	2,800	francs.
1772, duc de Choiseul sale	3,600	"
1777, prince de Conti sale	4,800	"
1781, marquis de Pange sale	5,855	"
1808, duc de Praslin sale	13,000	"
1812, de Sereville sale	15,000	"
1825, prince de Galitzen sale	24,300	"
1826, bought by Sir R. Peel for 929 guineas, at the sale of de la Haute.		

Gerard's drawings have often been confused with those of his father, his brothers, Moses and Herman, and his sister Gesina; but since the discovery of the family documents, it is now easy to distinguish between them. The Louvre possesses but one; but at Berlin and Brunswick are several. Two of his best pictures are in the London collection, the "Peace of Münster," presented by Sir Richard Wallace, and the "Music Lesson" of the Peel collection; but there is scarcely a gallery that does not possess several examples, more or less notable.

COMMUNICATIONS.

ADVERTISING IN ARCHITECTURAL JOURNALS.

TORONTO, March 21, 1888.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In reference to your first article in the *American Architect* of March 17, perhaps I may remark for the encouragement of advertisers how important the advertisements that appear in your paper are to architects. I invariably look through them and if there is anything striking that I at any time am likely to require I have that advertisement cut out and stuck into a classified advertisement book that I keep for reference. In writing for particulars I always state that the advertisement appeared in the *American Architect*, but it is as you say almost impossible to do more by way of letting the advertiser know that his "ad" has been seen. I have sometimes wanted an article that has been advertised, but which advertisement is discontinued, and if it happens that it has not got into the advertisment reference-book there is no chance of looking it up. More than once I have had to do without an article because it was not advertised recently. One cannot expect an advertiser to go on putting in an advertisement on the chance of a single or very occasional order but I venture to submit that advertising in the *American Architect* does more good than harm, to say the very least.

Yours truly, ——— *Architect.*

DEAFENING FLOORS.

PHILADELPHIA, PA., March 17, 1888.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—My attention has been called to the 131 page of Vol. XXI of the magazine, bearing your respected name as publishers, and I find there a note by the editors in answer to an inquiry, "H. C. B.," under date March 7, 1887, from Buffalo, N. Y., respecting *deafening wooden floors*. In this note the process described is spoken of as a well-known process much used—"in the so-called New York way"—"in the Boston way." I would thank you very much to let me know at your early convenience where and by whom this process is used or has been used, so that I may be able to make further inquiry respecting it, of those who have applied it in their own work and know something of its effectiveness and ease of application.

Do you know if this process is covered by any letters patent?

Yours truly, S. DAVIS PAGE.

[THERE is no patent, so far as we know, on this sort of plaster deafening, either on the New York method, of putting the mortar on boards cut in between the floor-timbers, or the Boston plan, of putting the mortar over the under-floor boarding. Any New York or Boston plasterer would know something of the process. A still more recent device, which is said to be effectual, consists in laying slabs of porous terra-cotta, cut to fit, on billets nailed to the sides of beams. This would produce less dampness in a completed building than a mortar process.—EDS. AMERICAN ARCHITECT.]

A DRAUGHTY CHURCH.

MIDDLETON, CONN., March 8, 1888.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—There is a church in this place where great annoyance is experienced by the attendants from a disagreeable draught, the cause of which seems impossible to determine. Can you refer us to any one who is considered an authority upon such matters, from whom we can obtain advice as to the source of the trouble and its remedy. An early reply we shall esteem a favor.

Respectfully yours, J. W. HUBBARD & CO.

[ANY good ventilating engineer, like Mr. Tudor or Mr. Mills, of Boston, Mr. Baldwin, of New York, or a dozen others can solve the problem satisfactorily. We should say, for a guess, that the draught complained of might come from some large window high up in the building. Even if the window is tight, the air, chilled by contact with the glass, will sweep downward over its surface, and continue descending until it reaches the people below, where it is felt as a cold current.—EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS.

THE FORT OF GOLCONDA.—Golconda has an old, old history. Hyderabad, with all its years, and great population, and bloody history, is young in comparison with the dead city whose acropolis rises from the plain three miles in the distance, on our left. The blocks of black granite which lie scattered over the country here lose their individuality, and form a vast cone, on the apex of which stands the grim fort of old and rich Golconda. The fort is still surrounded by its crenellated stone wall, which is three miles in circumference. It has eighty-seven high bastions at the angles, on which are still the ancient Shahi guns, some of them with their breeches blown out, from service in half-forgotten wars. The bastions are built of solid blocks of granite, either cemented together or bound with iron clamps. Many of these blocks

are of immense size and weight. Their average thickness is from fifty to sixty feet. On the way up we passed many battlements. It was fort within fort. We saw many fragments of palace walls; decayed mansions, where fragments of the delicate jalousies told the story of former splendor and social elegance; and heavy guns which had grown rusty in their long silence and disuse. On our right we saw an immense piece of masonry — a chambered wall with granite substructures — the whole covering a catacomb of fabulous dimensions. Here lay the buried wealth of Golconda in the old times when the kings revelled in untold glory, and their very names were symbols of heroism and treasure throughout India. What this treasure consists of is not well known, but most probably it was in jewels and gold. They were buried somewhere in these far-down vaults, and only the king, with possibly his premier, knew its exact whereabouts. He had a diagram of the catacomb, and knew where to go with his diggers, who were probably blindfolded when in sight of the treasure. When treasure was taken out, the place was walled up again, that all trace of the locality might disappear. It is believed, according to the best information I could derive, that vast wealth is still stored here, which is at the service of the Nizam when his revenue from regular sources gets scanty. I noticed that there had been recent openings in the solid masonry, but could not tell whether they had been caused by making repairs or for outlets for the concealed treasure, and again walled up. The "mines of Golconda" are a pure myth. The diamonds and other precious stones discovered near Parteell Cuddapah were brought here for sale, and were readily purchased by the rulers and their wealthy court. They were cut and polished here, and were regarded as equally good with gold as permanent treasure of the realm. The burial of them for future emergency gave the popular impression of a mine. — *Rev. Dr. Hurst, in Harper's Magazine.*

Brick and Stone Bridges of Large Span. — Professor E. Dietrich, of Berlin, enumerates 57 bridges of brick or stone existing which have a span greater than 130 ft., and says that there are no others over that size. Of these 22 are highway and 22 railroad bridges, one carries a canal, and one an aqueduct. Of the 57 there are 27 in France, 13 in Italy, 10 in England, two each in Austria and Spain, and one each in Germany, Switzerland, and the United States. The American bridge has the largest span of all — It is the Cabin John Bridge, near Washington, which is a single arch of 237 ft. span. Of the 57 bridges only three others are over 200 ft. span; 10 are between 164 and 200 ft., and 43 between 131 and 164 feet. Fourteen of them were built before 1800; 22 between 1800 and 1860; 5 between 1860 and 1870; 6 between 1870 and 1880, and the remaining 10 since 1880. In 22 of these bridges the rise is between one-third and one-half the span; in 18 between one-third and one fourth; in 10 between one-fourth and one-fifth, and in 6 between one-fifth and one-eighth. One bridge, in Turin, Italy, has a still flatter arch, the rise being in the proportion of 1 : 8.18 to the span. — *Railroad and Engineering Journal.*

The Drainage of the Campagna. — It has long been known that remains of ancient drainage works exist at different points in the Campagna, but it is only of late years that it has been possible to examine in detail the system of their construction. During the building of the new forts which surround Rome deep trenches have been cut into the soil, and by these old drains have been exposed in many parts in sufficient numbers to throw light on the method followed by the designers of them. On this hint, and taking advantage of the excavations, further search has been made, and it is now clear that a great part of the Campagna was in the distant past made healthy by systems of local drainage. Each hill or bluff on which a house or village was built was intersected by a net-work of drains, that often rose above each other in two or three tiers, and finally either carried the water away to the nearest outfall or stored it for agricultural or domestic use. One of the most perfect examples of the latter form was discovered in a hill on which the fort outside the Porta Portese stands. At a short distance below the surface of this hill, which was once occupied by an important Roman villa, the workmen came across the upper tier of drains. A system of tunnels about four feet high and nearly two feet wide has been cut through the porous rock, the top being strengthened by pairs of large tiles meeting in the centre and forming a gable roof. All the galleries of this tier converge with a very gentle slope to a common outfall, which leads the collected water to a second tier, that spreads its passages through the rock a few feet lower. The outfall of this second tier differs from the first in being narrowed to a small gullet, which was closed by a sheet of lead some eighteen inches square pierced with numerous holes so as to act as a strainer. This sheet of lead was found *in situ*. The third tier of galleries, about forty feet from the surface, and cutting the hill in cross lines directly beneath the upper systems, differs from these in three respects. Its floor is perfectly level, it has no outfall for its water, and it has a far larger section, being six feet high and nearly three feet wide. It was designed to serve for the storage of the water flowing into it from the upper drains, and was like them connected with the surface by a perpendicular shaft up which the water could be raised. All the shafts were provided with steps in their walls, traces of which still remain, for the use of workmen employed in cleaning the drains. As soon as these drains had been cleared of the accumulated deposit of centuries, though it was then a dry summer season, the water began to flow again and the cistern soon filled. The drains still discharged, as well as when first built, their double function of sanitating the soil and providing a constant supply of water for the use of the villa that stood above. — *The National Review.*

Value of a Walnut Log. — Curly walnut is highly valued by veneer makers, if it contain the right kind of figure. A curious story comes from West Virginia about a curly-walnut log. A woodsman found a tree somewhere in the region about Kanawha Falls, that he concluded was very valuable. He secured a sample and forwarded it to a handler of such wood in Baltimore. The result was that the discoverer received an offer for the tree, probably amounting to $2,000. Subsequently the Baltimore man sold a share of the chance to an Indianapolis dealer, who opened negotiations with the woodsman for possession of the prize, at length going to West Virginia to prosecute the enterprise. When the affair had reached this stage the woodsman concluded that the tree was worth $3,000, and demanded that sum for it, or he would not yield up his knowledge. Seeing that the Indianapolis man was bound to find the tree, if possible, the discoverer cut it down and buried it in the earth. A thorough search has, as yet, failed to reveal the hiding place of the log, and the man who holds the secret declares that nothing but $3,000 will bring it to the surface. — *Northwestern Lumberman.*

TRADE SURVEY

Nothing short of personal contact with business interests or personal correspondence with intelligent and responsible authorities will enable the reviewer of markets and trade to know the actual conditions. The usual commercial signs signify very little just now. The reason is that this is what might be termed the incubating season for business. During the next thirty days perhaps sixty per cent of the volume of new business for this year will be practically determined upon. This business will not be shown in railway earnings, volume of exchanges, or in financial statements, or in any of the ways which commercial activity usually shows itself. Boston builders have already shown what they expect to do. New York architects and builders have shown that they have and expect to have about as much work this year as last, that activity in house and flat building has not been overdone, that suburban building activity will assume very large proportions, that railway-terminal facilities and rapid-transit facilities will probably be determined upon this year, but not in time to effect building interests, and that the vigorous growth that characterized manufacturing, commercial and building operations will be repeated this year. It is true less may be prosecuted than projected, but a conservative estimate as to probable construction gives the higher limit as the one to count on. Building operations in the territory within one hundred miles of New York city will be fully up to last year. The tendency is still to concentration with regard to manufacturing, storage and distributing facilities. Railroad work will be abundant. Low prices of iron, steel, lumber and building material will encourage the prosecution of several railroad building enterprises, such as terminal facilities at New York, Philadelphia, Staten Island, possibly, and additional facilities at several outlying points for the freer and cheaper handling of heavy freights. The Reading Company has about completed its real-estate purchases for the extension of its road from Ninth and Greene Streets to Twelfth and Market Streets, Philadelphia. The Pennsylvania Company will extend its station facilities at its present Filbert and Broad Street Station, probably doubling them. The same company is credited with the intention of enormous expenditures at and near Pittsburgh. It has orders out for one hundred and seventy-two engines and has schemes in hand for the improvement of its lines west of Pittsburgh. It is understood the Baltimore & Ohio management contemplates some very important improvements along its lines and branches as soon as it can disentangle itself from the errors of the previous presidential management. Other roads having Atlantic coast termini will also enter upon a policy of improvement and expansion which will reflect favorably on all industries that will in any way contribute supplies. Southern roads, it is ascertained, contemplate large additions of mileage and other improvements, which will help Southern industries identified with railway development. In fact, already large car-orders and orders for all kinds of railway material have been placed this month at Chattanooga, Rowe, Anniston, Decatur and other industrial and manufacturing centres South. This rather extended reference is made to assured facts in order to dispel the notion entertained that railroad companies will be small and parsimonious buyers of material this year. The circumstances surrounding as much as forty thousand miles of American railway mileage compels liberal supplemental expenditures. This source of demand will compensate for a falling off in new lines. In addition to this, mill and shop products will be in demand in many new directions. Pipe-lines, tunnels, elevated-road work, rapid-transit projects, elevator building, warehouse building, besides an extraordinary activity in manufacturing, and mining enterprises in the West and South will all help to swell the volume of work to be entered upon. From many quarters the replies made to inquiries show that house building will be of last year's magnitude in the aggregate. Builders have been agreeably surprised at the large number of absolute sales made and the evidences of a continuing demand. The character of these cheap houses is improving year by year. Cheap plumbing and carpenter work is disappearing, and more attention is being given to good and enduring work. There is much house building work to be done in the States between Ohio and Minnesota. Lumber will be low; nails have reached cost, practically; all building material is at as low a price as it will probably reach, and builders and those employing them will make the best of these opportunities. Iron and steel makers anticipate a busy year. Machinery makers have work in sight up to early summer. Textile-goods manufacturers admit the market is beginning to absorb their productions more slowly. Stove manufacturers East complain that Western manufacturers have cheaper iron by a dollar or two per ton. Builders of heavy and special machinery predict greater activity in machinery. Agricultural-implement makers will not accumulate stock, further. Money-lenders are still quite anxious to loan on good Western securities. In the Southern States investments are generally made in person or by proxy rather than to loan money. Large timber tracts are being picked up. Desirable mining lands near railroads and streams which can be used to reach railroads are rapidly passing out of first into second and third hands to be held for future advances. Western shop capacity is on the increase and machinery makers in the New England and Middle States have a large amount of shop-equipment business under contract. The production of anthracite coal is just equal to the output at this time last year. The iron output is twenty per cent less. Logging operations in the Northwest point to a ten per cent deficit, which will probably disappear when returns are all in. Southern lumber manufacturers are all striving to enlarge their production in anticipation of dividing the Northern markets with the Michigan lumber interests, in part, at least. Tariff agitations continue to check the easy and natural development of business, but the heavy consumption in progress and the preparations for its increase gives a strong undertone to business and leaves business men confident that there are no worse evils in store for them than lower prices, narrower margins and longer credits. This tendency will exhaust itself soon because of the natural expansion going on which will develop a better demand for money-products and labor and open still wider fields for enterprise.

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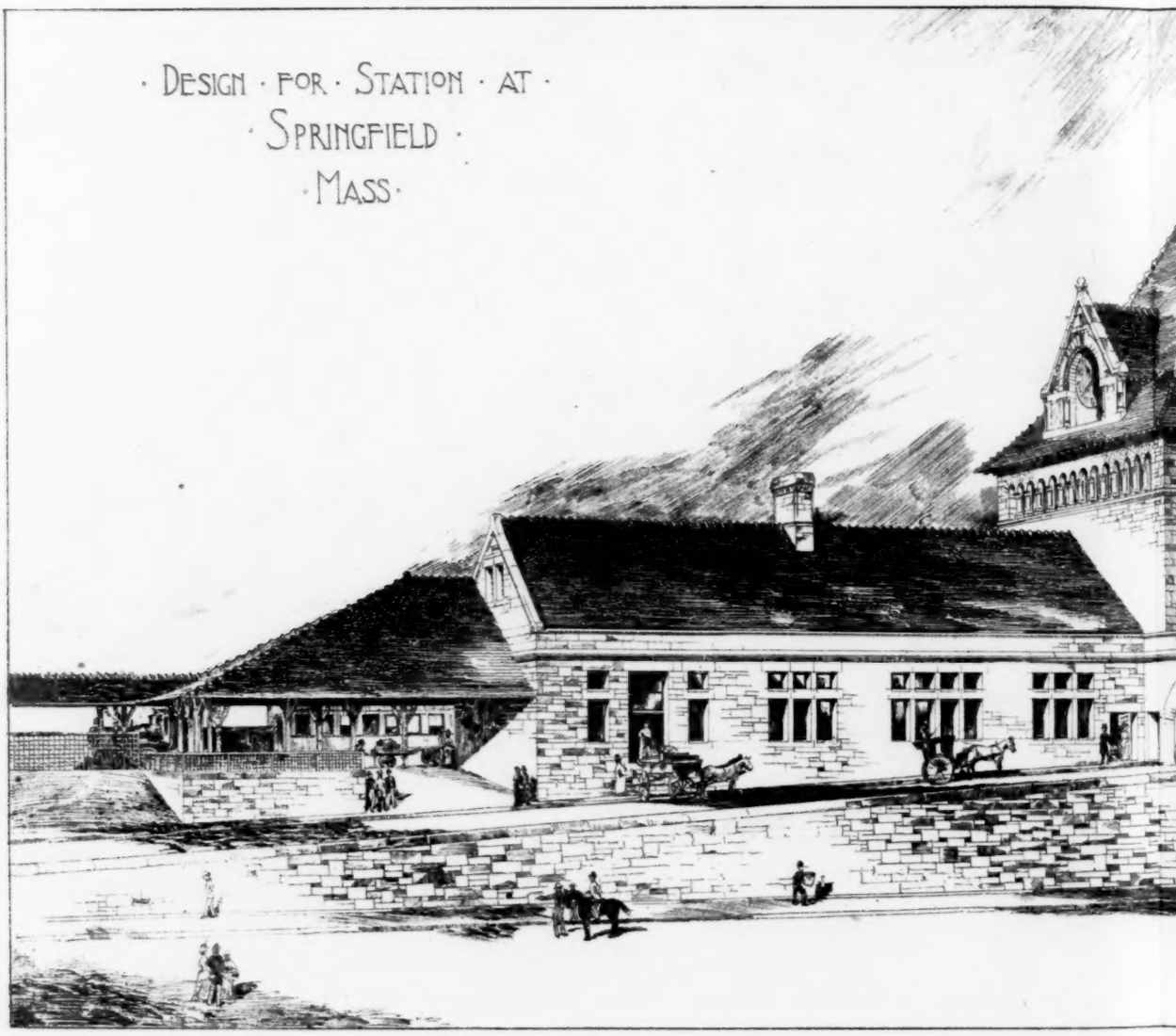

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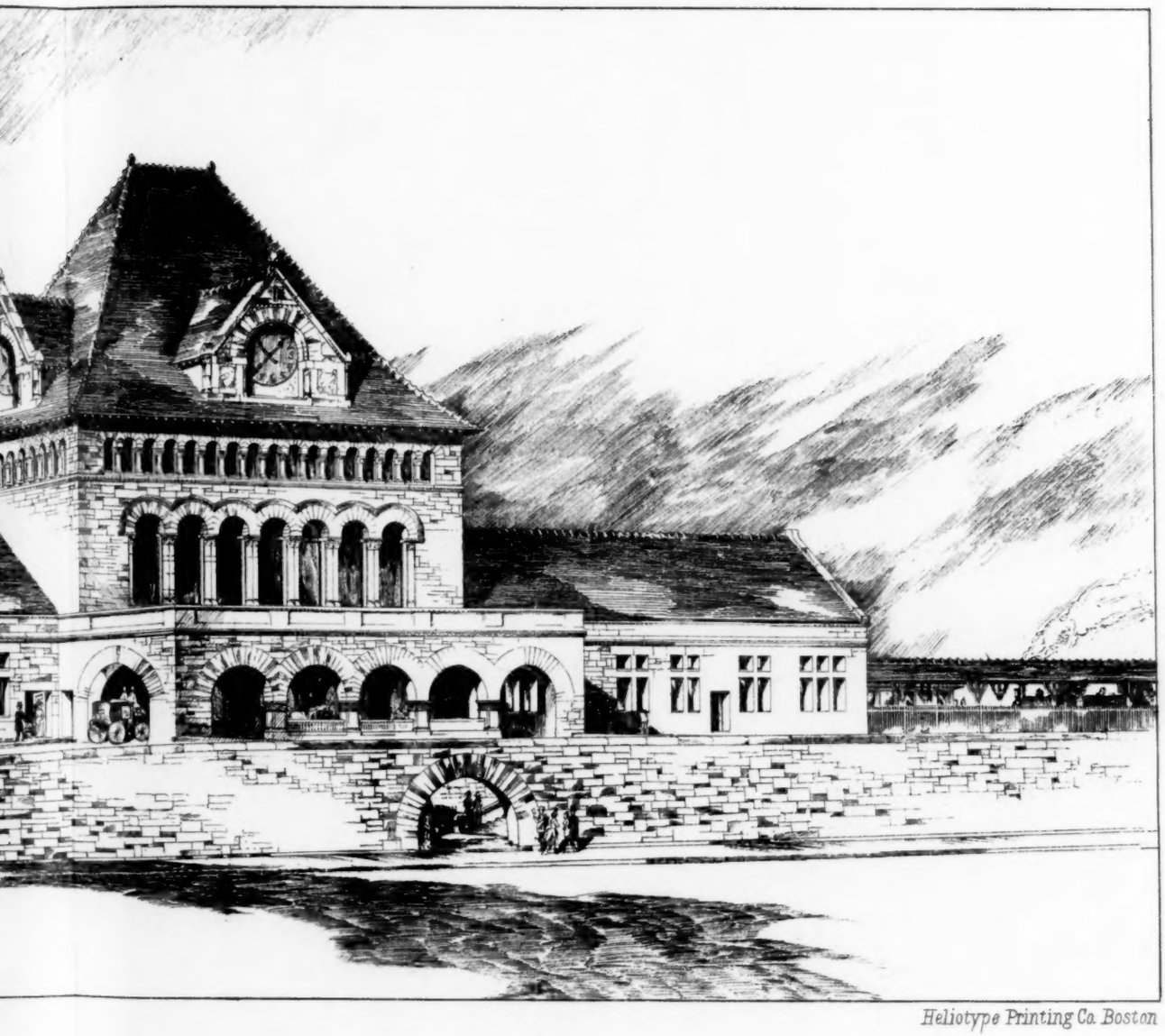

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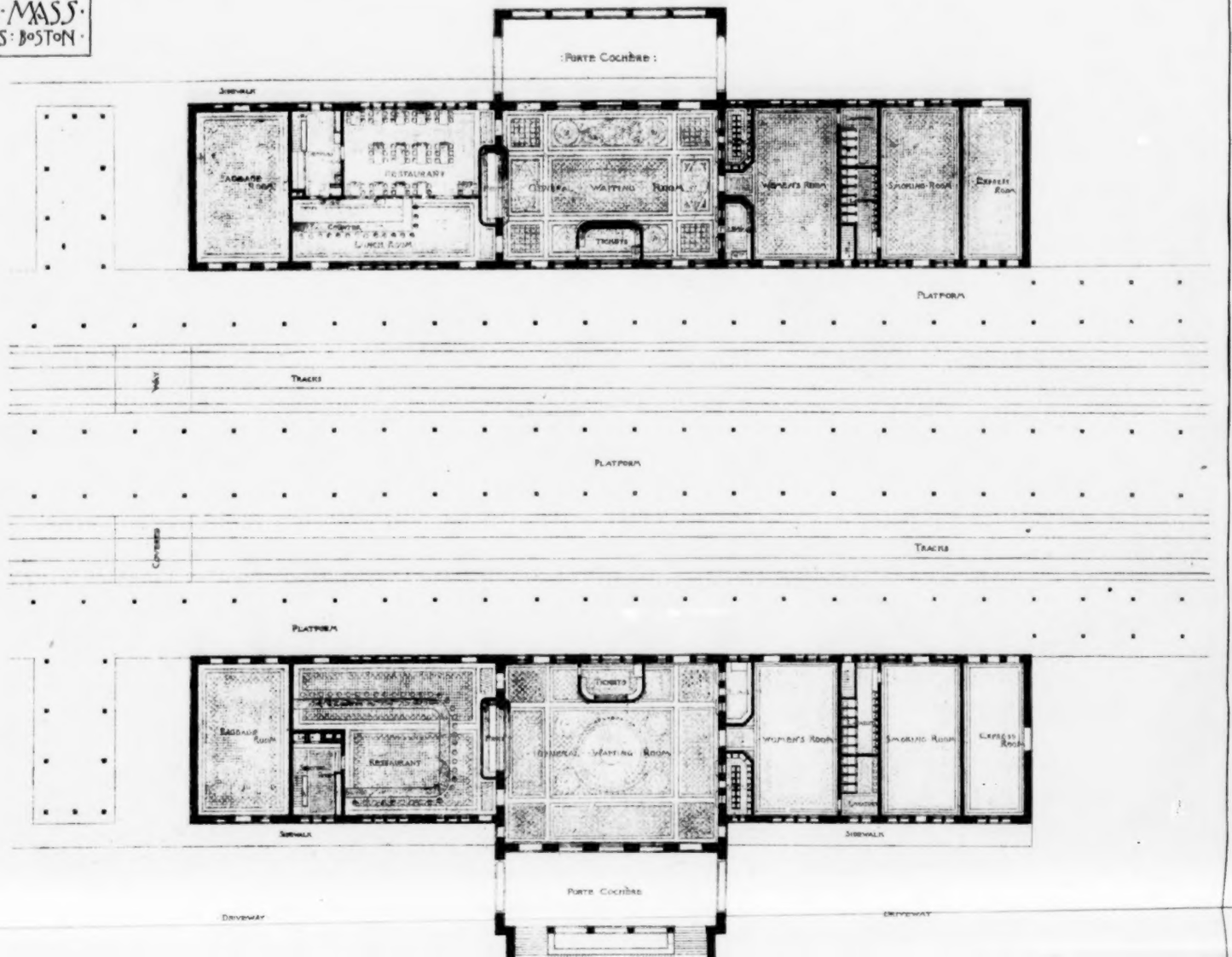
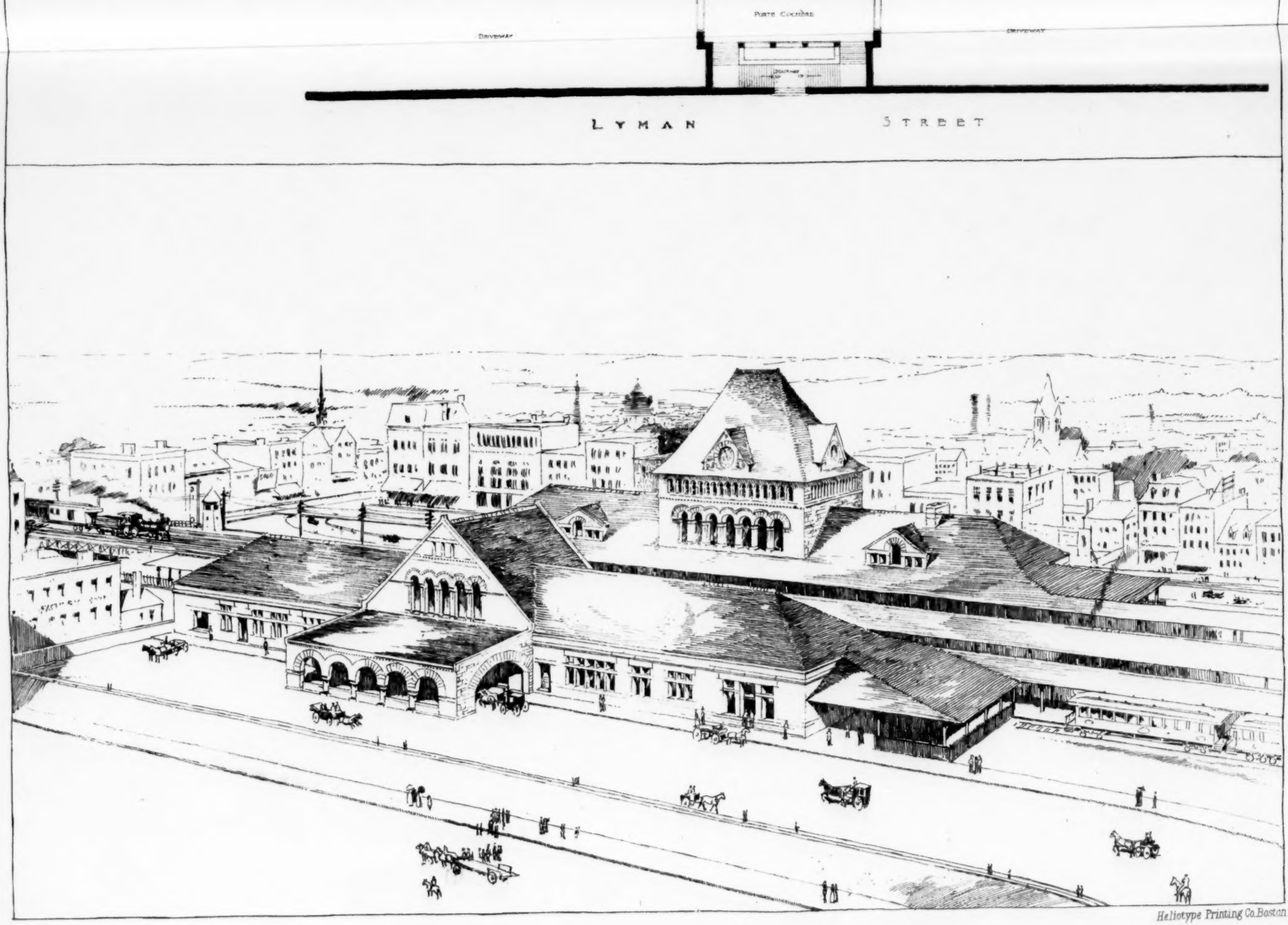
BIRDSEYE VIEW OF PROPOSED STATION AT SPRINGFIELD MASS.

SHEPLEY RUTAN & COOLIDGE ARCHITECTS BOSTON





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ARCHITECTURAL LEAGUE PRIZE COMPETITION. Timothy Hall.

"MEMORIAL CLOCK AND BELL TOWER ON A VILLAGE GREEN."

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AMERICAN ARCHITECT AND BUILDING NEWS, MAR. 31, 1888 No. 640.

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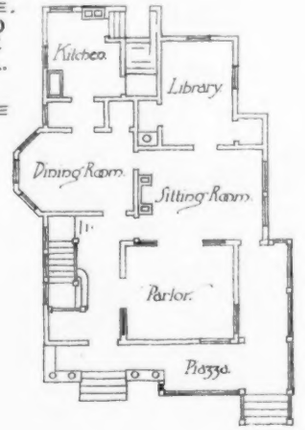

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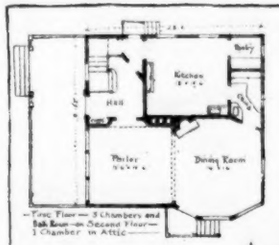

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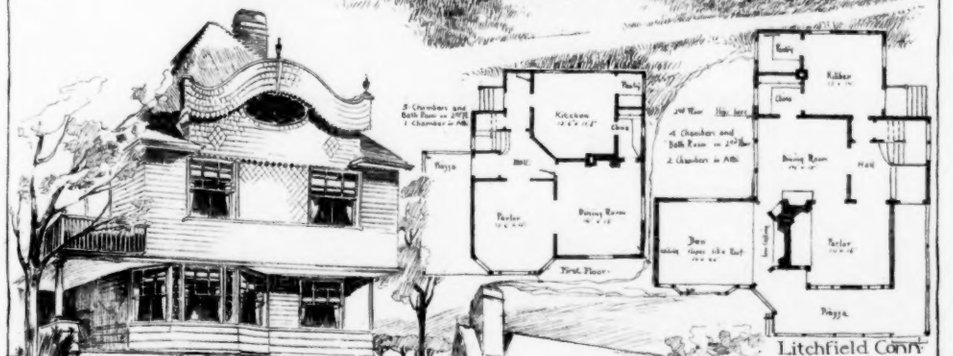

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